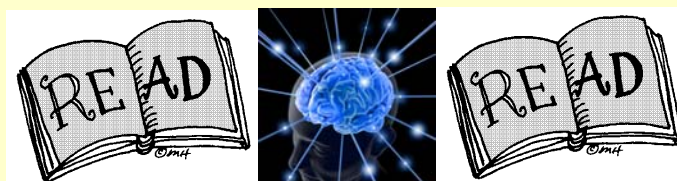


# Notes on Engineering Research & Development (An IITK Students' Publication)



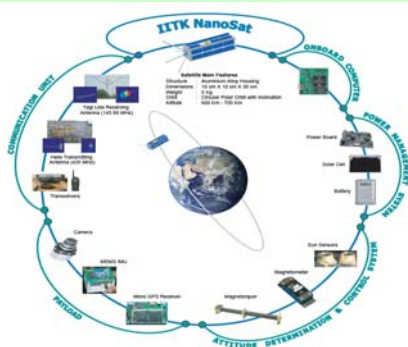
July 1, 2009 Vol. 2 Issue 0



## INSIDE...

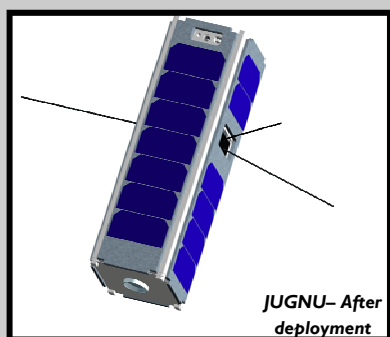
PoWER	2
SnT Clubs round up	3-4
CESE Building	5
G-E3	5
Eyes on the Skies	6
ICARUS '10	6

## 'Jugnu'



IIT Kanpur is onto its Nano Satellite Mission-Jugnu, with a team of students (from 1<sup>st</sup> year undergraduates to final year postgraduates) under the guidance of faculty members and scientists of ISRO to launch India's very own first Nano Satellite. The mission hopes to purvey miniaturized space technology to India and space systems experiences to the students.

The mission when realized will give India a less than 3 kg (10\*10\*32 cm in size) machine, with functions similar to a normal satellite.



The payload will consist of indigenously designed camera for IR remote sensing, a GPS receiver and an Inertial Measurement Unit.

Jugnu, when ready, will be launched from Satish Dhawan Space Centre, Sriharikota, Andhra Pradesh by ISRO's Polar Satellite Launch Vehicle (PSLV).

The objective is, not making a nano satellite alone, but also to develop potential human resource and infrastructure for space research programs in the institute working side by side with ISRO. So, come forward and help us realize it.

## Dr. H.C.Verma — Naam To Suna Hi Hoga



Dr H.C. Verma needs no introduction. The idol for all JEE aspirants, the favorite of all students who have ever attended his PHY102 or PHY103 class,

the godfather of all kids from various underdeveloped localities close to IIT Kanpur, the pedagogical Guru and a great social engineer. NERD team got the pleasure of talking to him about various facets of his personality. Here are some of the excerpts of his interview with us:

**NERD:** Sir, you have been in this institute for almost two decades. What trend have you witnessed in technical and research activities over the time and students' involvement in them?

**Dr. Verma:** The technical activities have gone up very significantly. When I was a student here, the only such activity I saw was through the Physics Society- talks by professors and paper reading contests. Now, students are getting more involved in research activities as SURGE and going out for summer training at various research centers and universities all across the world.

**NERD:** Your book 'Concepts of Physics' is nationally reputed and respected as the Bible of Physics. What was your motivation and inspiration for authoring that book?

**Dr. Verma:** (Laughs) I started teaching Physics at the reputed Patna Science College in 1979. I was asked to teach B.Sc and M.Sc students as well as those in standards 11 and 12. I was a big fan of the book by Resnick and Halliday, but I was unable to motivate students of standards 11 and 12 for understanding physics by teaching with that book. It was indeed a shock for me. Over the years, I realized that I enjoyed that book because I studied it in my M.Sc., when I was mature enough to appreciate its beauty. I looked for other physics books for my students but could not find one containing the same implicit beauty of physics. Finally, I decided to give a try at authoring one such book. I took 8 years to complete it.

**NERD:** You have been taking various initiatives for innovative physics teaching at school level by devising many simple demonstration

experiments for students. Can you please elaborate on your favorite experiment?

**Dr. Verma:** (Smiles) I have devised around 150 simple experiments and have an emotional attachment with all of them, but the one that has clicked the teachers the most is the 'Dettol Bottle Experiment'. It demonstrates the internal reflection of light from a water surface in a dettol bottle. We take a dettol bottle, fill it partly with water and make it turbid by adding dettol or soap. Then a laser beam is introduced through the sides, which gets internally reflected by the water surface. Due to turbidity, the path traced by the beam is clearly visible and the internal reflection of light can be easily seen. Invariably, all the teachers who have seen this experiment have given it a loud applause, and they have told me that the reaction was similar when they performed this in their class in schools.

**NERD:** It has been felt that the very instinct for gaining knowledge gets

**"Target of cracking JEE is a false target."**

drastically low among students once they clear JEE. Do you think that efforts like Anveshika can regain their interest in science?

**Dr. Verma:** The roots for this problem lie in the school education, which is unable to set a nice goal for the students. I receive mails from students of class 11 and 12 that the goal of their life is to crack JEE. These are all false targets. Once the goal is achieved, they have nothing to do. The education in science has such a beautiful path to follow, but science is taught in history fashion in schools. The bigger joy of discovering nature is not experienced and put forth. Anveshika is essentially an open ended laboratory where uncommon experiments are set up without constraints of any board syllabus or examination. New experiments are continuously evolved as and when any idea strikes the students or the teachers. Students in classes 9, 10 and 11 need to work in such areas Dr. H. C. Verma

**NERD:** Your home page states that the present education system in the country lacks the basic elements of practical knowledge, ethical and virtuous values. What pedagogical techniques or improvements would you suggest at IIT Kanpur?

**Dr. Verma:** Well, as you see, it is too late for students as they are already

forged by 15 years of school education. Yet, we can try. When I take the first year B.Tech course on physics, I perform small experiments in class to correlate theory with practical, and tell them stories about the interrelation of different aspects of education. Just pumping in information is not the pedagogy to be followed with IIT Kanpur students. They probably need no professor for it. But we give them too much of information and no education. The music masters teach one 'Raga' to their disciples and rest is left to their creativity. Such pedagogy needs to be implemented here too.

**NERD:** No platform exists in IIT Kanpur where people working on various research areas can write for the general audience. NERD is such an initiative. What plans would you suggest to sustain it?

**Dr. Verma:** NERD is an attractive idea. There are two aspects involved with people active in research- their own personal careers and the satisfaction of being heard by a larger audience. If they are provided an opportunity with not much time constraint, they will contribute to NERD and this would be beneficial for the campus community in general. I would personally love to contribute as much, and with 300 faculty members in IITK, you need not worry about its sustainability.

**NERD:** What do you think was the vision of setting IIT Kanpur? How far we have realized it in half a century?

**Dr. Verma:** IITs were set up to develop a technological base which can drive India into a global competition. Yes, IIT Kanpur is an international brand name now. I have seen a significant contribution of students recently in managing the show, despite the fact that they come after 15 years of forging.

**NERD:** Describe Dr. H.C. Verma in one line.

**Dr. Verma:** (Thinks) I have experienced that science is very enjoyable. I try to integrate myself with education, science and society at large.

**NERD:** What is your final message to the students?

**Dr. Verma:** My message is that there is much more to explore in nature. Don't focus just on the course content. If you can appreciate the implicit beauty of science and engineering, it will be great.

# 'takneek'

The flavour of science and technology is tasted soon after you guys come into the institute. All the Clubs that are under the Science and Technology Council of Students' Gymkhana organize their introductory lecture(s) starting the first week, followed by the workshops which gives you guys a firsthand experience of how things work! What's more, you can attend the lectures by all the clubs and find out what's that really interests you. You also get a chance to know what your seniors have innovated over the last one year- during Takneek, during Techkriti, and summers. This is the first place where you kick start your 'engineering and science experience'. But what's the use of knowledge that remains unused, that remains untested, which remains unexploited! So soon after you guys know how to make the apple fall, it is time that we have a couple of them to taste. The Annual Inter-Hall Technical Festival- 'Takneek' is specially organized to give you all a chance to test your skills. The festival organized mainly for the 'new talent' has a whole bunch of competitions to participate in. There are competitions from Aero modelling club, Astronomy club, Business club, Electronics club, Ham club and Robotics club to check and sharpen the knowledge previously shared with you guys in the lectures and workshops. You guys come up with superb 'bots', circuits, gliders and what not to show that you are a class apart, fit to be classified as *IITians*. Apart from these there are some more exciting competitions like Crypto for the geeks who are always after codes, Nirmaan- the bridge making competition, Rubik's Cube competition and the 'Big Daddy' of all Rube Goldberg Competition for those who like complicating things! And is it all? No! Takneek brings some more lectures, talk and discussion sessions along with it that are there to improve upon our knowledge.

This competition provides an excellent means to come in contact with your seniors, who are always there to guide you through the problems that you'll face. Moreover these give you an excellent chance to come in touch with your batch-mates and come to know your new friends better. The competition also aims to provide the first flight of stairs for the Techkriti and other big technofests of other institutes.

In a world that has witnessed a fairy world transformation, the role of science and technology in altering human lives can never be overemphasized. Like Jonathan Livingston Seagull, the human intellect knows no barriers and Techkriti 2009 explored the power of the mind to the very limit.

The central idea of Techkriti'09 is to come up with ideas that change the course of human history - "transforming thoughts" are indeed the holy grail of innovations. Techkriti is also about transforming thoughts into reality; practicality and feasibility have been the elixir of existence.

With the theme 'Energy' Techkriti aimed to motivate new ideas and motivate thoughts towards a brighter future. Dr. David Morrison, Senior Scientist, Ames Research Center, NASA, inaugurated the Techkriti '09 on 12<sup>th</sup> February 2009, for the free flow of ideas to begin and for the thoughts to start getting transformed. Techkriti '09 also witnessed talks by Dr. G. Madhvan Nair (Chairman, Indian Space Research Organization (ISRO)), Dr. Ron Eglash (Fractals Study), David Hanson (CEO of Hanson Robotics and pioneer in humanoid robots), Dr. Lee Hartwell (Noble Prize in Physiology), Dr. Stephen Wolfram (CEO, Wolfram Research and famous mathematician), Deepak Munganahalli (Senior Vice President, Asia and Pacific Unit, Transocean Ltd and an IITK alumni), Dr. Shahid Habib (senior scientist, NASA), Kanwal Rekhi (Venture Capitalist, IITB Alumnus). While Dr. R B Grover (Director, Strategic Planning Group Department of Atomic Energy), Shailja Sharma (Head, Shell Energy Scenarios), Steve Myers (President,

Transocean India), Anil Patni (Head, Communication and External Affairs TATA BP Solar), Anand Kumar (Director, Research and Development Indian Oil Corporation), Rohit Bansal (COO, INDIA TV) shared their valuable thoughts in the Panel Discussion themed- 'Energy 2020'.

This year Techkriti also witnessed the launching of the yearbook named 'Transforming Thoughts' which contained a message by Dr. A. P. J Abdul Kalam and interviews of Mr. Ratan Tata, Mr. Jimmy Wales and Mr. Vittorio Colao. The magazine highlighted the research that is going on in the institute through various articles that came directly from professors.

## TECHKRITI'09

The fest also had exhibition - Tech-Planet which had the fascination of Zeno - the humanoid robot from Hanson Robotics; the Interactive Displays and Screens from GestureTek, UK.

Apart from these there were various competitions that were organized, in which students from more than 1000 colleges participated, and proved their mettle. The new competitions that attracted a major crowd were Rube Goldberg Competition, National Spaghetti Bridge making Competition, Crypto Contest- the online cryptology contest and the Junkyard Wars. International Online Programming Competition (IOPC), International Online Hacking Competition (IOHC) and 'Software Corner' gave an excellent opportunity to those computer geeks around the world to compete with the other best of the globe. The Indian

Open Rubik's Cube Competition (IORC) carried the trend from last year and gave the 'cubers' a stage to show their fast and furious performance. 'Endeavour' - the open hardware competition, 'Gearloose' - the gadget design competition, 'Cosmos' - the astronomy corner, and 'Eureka' - the Research Paper presentation competition where the best of the best were competing against each other. 'RoboGames', a point of central attraction, saw teams fighting against each other in 'RoboWars'. Electronic Circuit Design Contest (ECDC), was designed specially for those tied among the knots of the circuits. 'Turbulence' - the aero modelling corner included 'Pushpak', the glider making competition; 'Rocketrix', the water rocketry contest; 'Cruise Control', the competition to test the flying skills of an RC aircraft and its controller. 'Olympiz' contained another set of competitions for those finance-headed guys, who had their minds off in this season recession. Apart from these there was a Bio-business plan competition and 'Fox Hunt'(refer to Ham club).

In order to motivate the coming generation to think apart and give them the flavour of Techkriti and IIT Kanpur, 'School Bag' provided students from various schools to get a chance to interact with the professors, participate in various workshops related to robotics, electronics, aero modelling, and astronomy. Well this is not it! The fest had a whole lot of workshops conducted to train the students in new developments in the respective fields. The festival ended with a breath-taking laser cum pyrotechnic show Thriller SFX Fireworks, Mumbai.

# PoWER - Promotion of Work Experience & Research

Clean room, DST Unit for Nanotechnology IIT Kanpur, three students, waiting patiently for results to be shown on the screen, suddenly some images emerge and the group hugs each other. They have succeeded in getting first needle of 50 micrometer diameter for the world's cheapest diabetes solution they are working upon.

Students are taking lead. **Welcome to the new era of student-driven projects.**

With the advent of a knowledge-driven economy, there has been increasing emphasis on R&D activities in the corporate sector. An appropriate R&D mechanism is crucial for giving concrete shape to new ideas as well as ensuring the formulation of policies that lead to sustainable growth in the long run. On the other hand, academic institutions also need the co-operation of the corporate world to facilitate demand-driven innovations and harness the talent of the students in a positive way. There is growing recognition of the need of an organization that can serve as a platform for coordination of R&D work across the spectrum, from corporate bodies to academia, and government establishments.

Keeping in mind these imperatives, we have started a new group at IIT Kanpur, named PoWER (Promotion of Work Experience and Research). The organization is concerned mainly with handling industrial projects and fostering new student ideas.

## PoWER: An Idea

PoWER is an organization formed with the objective of helping you transform your visions into concrete, workable ideas. It is an organization which will be managed primarily by students, so you will get an opportunity to pursue your ideas in the way you want to. You can either work on your own idea or with our groups on projects commissioned by the corporate sector. Moreover, if you are interested in some particular area of endeavor, you can join one of our various interest groups, which will help you in further work in that field.

## Mission and Vision:

- PoWER envisions the dream of shaping India through its technocrats and intellectuals.
- To make innovation and technology development a culture among the students.
- To engage students in solving industrial and other socio economic challenges.
- To make sustainable and inclusive development implicit to our national development.

## Types of projects:

Broadly, the projects under PoWER will be categorized under three types:

- **Projects/ ideas from industries/other institutions/organizations to students:**  
All projects will be first assessed, then advertised and an autonomous time-bound target-bound group will be formed.
- **Project ideas brought by students:**  
External agencies like industries or government bodies will be sought for funding related supports. Also institute has allotted an annual budget of around Rs. 2 crore to support student ideas.
- **Projects offered by faculty/laboratories/departmental associations (societies)**

## Outreach:

It is a first of its kind initiative in India.

- We are working with **IIT Delhi** from the beginning and PoWER (with a name **Technocracy**) has been accepted there.
- Enthusiastic responses from different government bodies like
  - **DSIR:** Dr A S Rao, Scientific Adviser (Scientist-G) DSIR, says "It is an excellent initiative we were waiting for. We are very soon going to start a program in which industries will float their challenges for universities or other firms to solve. We would like to invite PoWER as our **National Student Partner.**"
  - **ICMR:** "Mentorship in collaboration with people in Medical Research is something new and can be initiated and ICMR shall be glad to do with PoWER" said Dr. Vishwa Mohan Katoch, Director General ICMR.
  - **Defense Science Forum, DRDO:** Ravi Kashyap, Convener DSF says "It will be great when students will start working on the national problems"
  - **MSME Development Institute:** H P Jaiswal, Asst. Director MSMEDI Kanpur says "Initiatives like PoWER are really required to turn the face MSMEs of India."
- Anjan Das, Senior Director, CII says "These are the times when triple helical R&D models involving Academia, Industry and Government Bodies are required and PoWER is a great step towards it, it's the only of its kind of initiative in India. We will love to give the problems."

With the establishment of PoWER at IIT Kanpur and Technocracy at IIT Delhi, we are confident enough that sooner or later we will have a national presence. At the same time, we will be able to evolve synergy with other platforms within and outside our country. Then only it can become a platform to create technology having global impact with sustenance.

You can submit your ideas at [power@iitk.ac.in](mailto:power@iitk.ac.in)

# Science & Technology Council: Clubs at a Glance

"Give me a lever long enough and a fulcrum on which to place it, and I shall move the world." – Archimedes.

And trying we are, to move the world with our technical minds. In line with this, the Science and Technology Council of Students' Gymkhana, IIT Kanpur aims to foster the scientific and technical interests among the students. The Council, which came into existence in 2000, embraces the principle of fun filled learning. This is achieved through the following clubs: **Aero-modelling, Astronomy, Business, Electronics, Gliding, HAM, Programming and Robotics.**

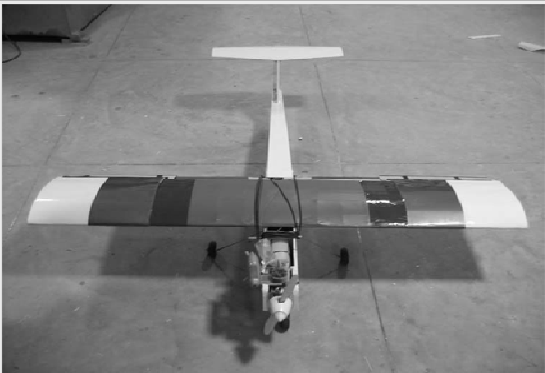
This year, the council took many initiatives to furnish a plethora of opportunities of experiencing the practical aspect of science and technology. This was done through the new activities conducted and completion of the projects of the clubs. Let's have a glance at them:-



Logo: Science & Technology Council  
IIT Kanpur

**Aero Modelling Club:** Ranging from a simple paper plane to remote controlled balsa plane models, the club made models that won many national level competitions and prizes. The completed projects include Tandem wing biplane, RC glider, RC ship cum car, flying rockets et cetera.

- The club offers winter and summer projects each year. These projects are for those students who want to do Aeromodeling beyond just making paper planes and small balsa gliders. Till now various projects have been successfully completed under this club. Control Line model, SNITCH, PEGASUS-the retractable wing aircraft are some of the examples.
- The club organizes regular competitions to make the whole activity great fun. The club also co-organizes the **Turbulence** in Techkriti. It consists of a RC plane flying competition and balsa glider making and flying competition. It also organizes competitions such as Glider making, Boomerang making etc. in Takneek, an intra IIT Kanpur Science and Technology Festival.
- Regular lectures and workshops are being organized to expose the novices to the fundamentals of aerodynamics and stability, making of paper plane models and design of thin sheet balsa models.



Pegasus

## Astronomy Club:

Observation sessions are organized by the club to introduce new members to the basics of sky gazing. Beginners are taught to handle telescope, read star charts, and the more advanced members go for deep sky objects- Galaxies, Star clusters, Nebulae etc. Introductory lecture and Hubble space telescope lectures were held. Astrophotography and 4 editions of the wall magazine speak of the regular activities of the club.



Eyes on the Skies'09

**Business Club:** The purpose of Business Club is to create a community in order to inspire, encourage and inform students about business world and entrepreneurship. Business Club, IIT Kanpur has two sub-parts: 'Sigma' and 'fineit'. 'Sigma' is related to marketing and workshops on Finance, Business, finance enthusiasts at IIT Kanpur. The club holds regular lectures and workshops on Economics, Marketing and related fields which are worth attending. We also organize a basic course for beginners under B-Club namely BIZ101. We had a workshop by 'Goldman Sachs (leading global financial services firm)' on 'Qualitative Analysis', 'Modelling and Statistics' and 'Interactive Session' along with a workshop on 'Credit Crunch' by some experts of this field during the year 2008-09. Most exciting part is we not only conduct these theoretical things, but are also aim to project students to real market situation through strategic games.

## Gliding Club:

Want to see the top view of campus? Have adventurous attitude? Gliding Club organizes regular gliding rides for students at air strip in campus. Just pay Rs. 180 and have a joy ride. You can also be a regular member of this club and get a student license for gliding.



A glider at the gliding club

## Electronics Club:

The Electronics Club, awarded the Best Club of IIT Kanpur in 2008, is the place for all technical enthusiasts to come together and improve their skills with electronic gadgets and circuits. The club organizes lectures on various topics related to digital and analogue circuits. These lectures assume no prior knowledge – so all are welcome, even if one hasn't even heard about an IC before. All that is required is an enthusiasm to make your own electronic wonder!



Musical Fountain

Events throughout the year include not just lectures, but also workshops, which help you to get practical first-hand experience of the new concepts. These workshops are conducted by knowledgeable people who will guide you. Competitions are held throughout the year to test your knowledge and skill against your peers. These competitions hold the key to the growth of your knowledge and certify your excellence in the field. Some good projects that were undertaken this year included interesting ideas such as Ping-Pong, Tic-Tac-Toe (which was implemented using microcontrollers), Whac-a-Mole, etc. The Club also offers Summer Projects on microcontrollers which combine the realms of programming and electronics. Projects made in the last summers include a Digital IC Tester, Tilt Sensor Game, PC Oscilloscope, etc. The Electronics Club is well equipped and will provide you with a very wide variety of electronic equipment and components, as also a huge reference library of books on electronics. It also maintains an active website where you can know the latest happenings in the club and obtain reference material to help you in your endeavours.

CYCLEMAN

NERD Team had a talk with Mr. Saurav Saket, a research assistant in the Center for Mechatronics, who is seen riding on the roads of IIT Kanpur, on his self-made motorized cycle. He can ride it at a top speed of 30kmph.It can run for about 40 kilometers at a time,once it is charged well for 7-8 hours. Initially, he made a cycle by welding iron pipes but soon realized that high temperature welding makes iron soft and brittle, thus making the cycle prone to breakdown on a bumpy road. Finally, he bought a cycle and started to convert it to motorized one. He got a motor and mounted it on the cycle.,but soon stepped in the problem and that was to mount batteries as they were heavy.Excessive weight on one side of the vehicle due to battery can wear out the tyre in case of braking in high speeds. Thus, considering average weight of a human being, an appropriate place for battery was chosen so that vehicle remains stable.He used a potentiometer to vary voltage across the motor in an analog fashion and controlling the cycle speed and normal disc brakes

The cycle is configured with a maintenance free 12v 7 AH \*6 battery, 1/2 hp motor and tubed tyres. Saurav is working on ways to replace the existing battery with lithium ion one which weighs less and lasts longer. The cycle uses timing chain of the automobile engine and is hence prone to chain break. He wants the current gear system to be changed into two stage gear reduction so that the tension on the chain reduces and its lifetime increases.

Finally our CycleMan leaves us with a message: "You can learn a lot of things from things around you, if you try it. Engineering is not to have all the things and then make something, but it's to make a lot of things from nothing."

-Attributed from Volume 1 Issue

(....Continued from Page 3)

NERD-S-PEAK

Hi all,

Just a few more days, and you are going to be a student in the Indian Institute of Technology, Kanpur, affectionately known by its students as IITK. Well done, hats off to you all.

Many of you might be worried about some things, like is my branch worth it, what opportunities am I going to get in my branch. Well, here's a piece of advice – stop worrying. These things are not worth worrying. In fact, you aren't going to get any time for it (You will see what I mean once you get here).

Well, many of you would surely be keeping pace with the research going on in the world. We never get tired of hearing the names of famous scientists and all. But have you ever wondered, what a student just like you, who goes to a regular engineering college might be doing a research on. And when I say 'research', I don't underestimate the meaning it holds.

Elaborating on NERD, Notes on Engineering Research and Development, as the name sug-

gests, the basis of this magazine is purely technical and scientific. The first three issues were purely IIT Kanpur centric. We totally focused upon the scientific research and development done by students here, at IITK. But science and technology can never be monopolized, can it? So, we thought of spreading the idea of NERD far and wide. And voila!!!! The fourth issue had three

-EDITORIAL

articles, one each from NIT Allaha- bad, NIT Nagpur and NIT Waran- gal. We are on our way to a scien- tific revolution, where students take lead. In short, NERD is some- thing is really grand and we invite you to be a part of it.

The natural question arises then: What benefit do I get?

- If you write an article for NERD, you reach out to thousands of readers, many of which are facul- ties. Many of these faculties are in search for students to assist them in their research. You may be the one.

- You get to interview one of the finest personalities who have set their own milestones in science. As for now, we already have the inter- view of Dr. APJ Abdul Kalam (to be published in Vol.2 No.1), Dr. Leslie Valiant, Dr. David Morrison and many more.

- One can improve his/her admin- istrative skills through financial co- ordination, marketing, issue- distribution, subscription, issuing tenders for printing, opening them and lot more.

- Rest assured, once you join NERD, your skills will be put to rigorous tests and we will leave no stone unturned in nurturing them further.

- So come forward and contribute. Write articles based on your inter- est, create scientific cartoons and sketches, contribute ideas (because we sincerely believe that no idea is stupid enough), interview personas with herculean achievements and do a lot more.

Waiting for the new NERDs,

See you all !!

**HAM Club:** Ham radio deals in wireless communication technology. We help our members in building their own rig (amateur radio equipment) and also experi- ment with antennas. Few of the major pro- jects are:

**DRM Receiver (Digital Radio Mondiale):** DRM Receiver is a radio re- ceiver which receives radio signals of around 30 MHz frequency (the one used by AM sig- nals) with the FM comparable quality.

**SDR (Software Defined Radio):** Soft- ware radio is building radios using software. Given the constraints of today's technology,



HAM receiver

there is still some RF (Radio Frequency) hardware involved, but the idea is to get the software as close to the antenna as is feasible.

**Satellite Antenna:** Various antennas for communi- cating with LEO (Low Earth Orbit) satellites such as helix antenna, egg beater an- tenna, etc.

**ASOC exam:** To obtain an ama- teur radio license in India you have to pass an exam conducted by the ministry of communications Ham club help students prepare for exam.

**FOX HUNT:** It is fun event organized by the club. Basically there is a transmitter (which we call fox, it can be mobile or immo- bile) which keeps emitting Radio

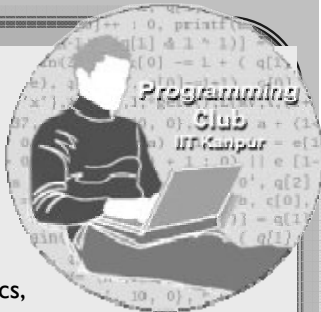
For more details about any club, log on to [http:// students.iitk.ac.in/snt/](http://students.iitk.ac.in/snt/)

All the information in these articles was compiled in collaboration with respective Club Co-ordinators and reference from website of Science and Technology Council.

Programming Club:

Programming club is a community of students who are highly enthusiastic about coding, hacking, web designing and all other aspects of programming. A member of this club is trained to hack into other web sites so that when developing their own web sites they can make it as secure as possible. The training involves lecture series on related topics, weekend programming contests and interesting summer projects. Some of them are:

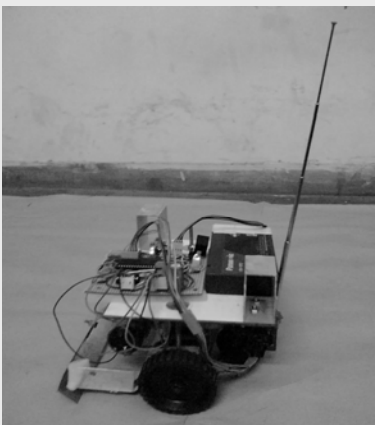
- **Image Editor:** The aim is to rotate, crop, sharpen, blur, and perform various other operations on an image.
- **Virtual stock market, StockSim :** It was developed under the club wherein one can test his luck on stocks and familiarize themselves with the various functionalities of Stock Market.
- **Bluetooth module for mobile communication:** It was also built using which one could move mouse, type text, handle applications of a computer from mobile via Bluetooth. The club focuses mainly upon familiarizing the students with the different aspects of programming and helping them to build useful applications.



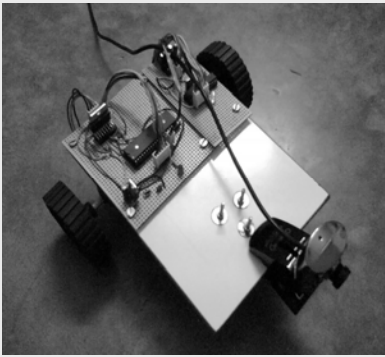
Robotics Club:

This club represents a family of enthusiasts who share the common interest of constructing robots. The club provides all requisite lectures, workshops, components, mechanical tools and workspace for both the novice and the experienced bot maker. Some of the accomplished bots are:

- **Autonomous Soccer Player :** This bot's functionality included identifying balls of a certain predefined colour scattered over the arena; approaching a ball; carrying the ball to a predefined goal; spurring the ball into the goal. It reached semi-finals in Techfest at IIT Bombay.



- **Autonomous Parking Bot :** An autonomous bot whose task was to emulate a self parking car. The task required the bot to differentiate between parked cars, walls, gaps between cars, parking space, actual parking spaces and obstructions. This bot won FIRST prize in Techkriti '09.
- **Line Ballower :** This was an autonomous bot whose task was to follow a line; pick up a ball kept at a certain location; carry it to box; place it in the box; and return back to the initial position. It won the first prize in Takneek '08.



# CESE BUILDING - INDIA'S 1<sup>st</sup> FIVE STAR GRIHA RATED BUILDING

The Center for Environmental Science and Engineering (CESE) building at IIT Kanpur is the first building in India to be awarded the 'five-star' GRIHA (Green Rating for Integrated Habitat Assessment) rating by TERI (The Energy and Resources Institute), with a score of 93 out of 100, on the basis of its 'green features' including insulated walls, ceiling and window glasses, reflective terrace, rain water harvesting, eco-friendly refrigerant for air conditioning and the use of solar energy for heating and lighting. These energy efficient features reduce the impact on the environment by reducing consumption of electricity and water demand and other requirements.

The building has been conceptualized, designed and constructed as a 'building in the garden', that is sustainable, environment friendly and energy efficient. Aesthetically integrated features allow a free flow of air and water in the built environment. This interdisciplinary research facility has been set up at IIT Kanpur integrating the fields of engineering, science and medicine to address various environmental issues.

The building's design was done with the goal of 'preserving and protecting the existing landscape'. Special care was taken in designing the building so as to incorporate most of the trees thus saving them from being cut or relocated. During the period of construction of the building, strict ecofriendly procedure was followed, demonstrated, confirmed and finally certified.



The aim of a green building is to minimize the demand on non-renewable resources— water, energy and materials, maximize the efficiency of these resources when in use and maximizing the reuse, recycling and utilization of renewable resources. It maximizes the use of efficient building materials and construction practices, uses

minimum energy to power itself, uses efficient equipment to meet its lighting, air-conditioning, and other needs, maximizes the use of renewable sources of energy; uses efficient waste and water management practices; and provides comfortable and hygienic indoor working conditions. The impact of such buildings on environment and human health throughout the lifecycle of the building— design,

construction, operation and maintenance— is minimal.

CESE building has the most advanced and efficient lighting system in whole IIT Kanpur campus. The lighting system is designed with controls and integrated daylight. There is almost no need of artificial lighting in day time, 85% building area is day lit. CFLs and CDMT (Ceramic Discharge Metal Halide) lamps have been used which consume less power and have longer life. Motion sensors are used in places to control usage of light 30% of internal lighting demand is met from solar energy using photovoltaic panels whereas outdoor lighting demand is met almost solely by solar energy. To decrease the building's air-conditioning requirements, passive space conditioning is used leading to a considerable saving of 29%.

The building is well equipped with solar water heaters -there are 20 solar collector panels to meet the hot water requirements. The building also has a water treatment unit to maintain water quality. Treated water is mainly used to meet landscape water demands. Altogether this has led to 59.6% water saving in the building.

With the use of such modern and energy efficient technologies, energy savings are order of 50%. Though initial cost of the building is increased by 10 to 15 % of the original, but the payback is expected to be obtained in nearly 5 to 7 years. An estimated net savings of 15% of total cost in 15 years is expected.

-Attributed from NERD Volume 1 Issue 3

## The Group for Energy and Environment Engineering : 'G-E3'

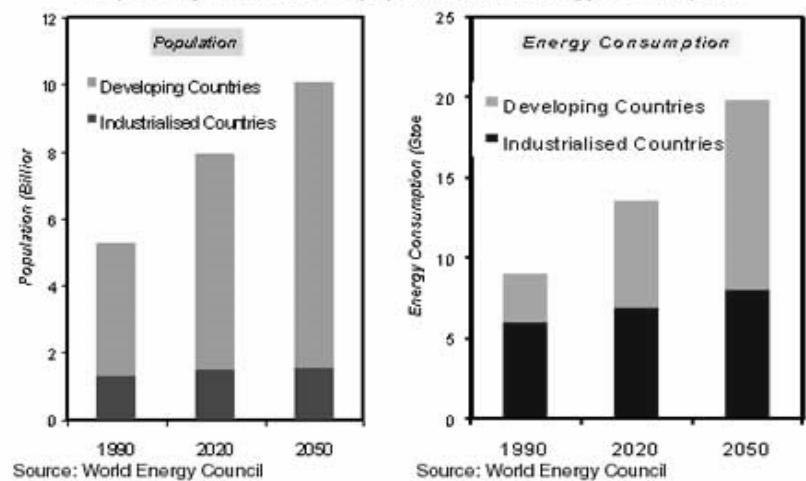
Congratulations to all of you on clearing JEE. You are lucky for being the part of the golden jubilee batch of IIT Kanpur!

We are sure that it must have taken every possible effort on your part and it is dream come true. You are going to join one among the most prestigious engineering colleges of the country with a wish of becoming the leaders in science and technology. We write this article to beware you with two of the most heavily researched and relevant topics that concern the world today i.e. **Environment & Energy**.

Energy is probably the most important requirement of humans after food, water and shelter, we use it constantly at home, at work and for leisure. Energy maintains our **standard of living** and economy. Nowadays we take it for granted that energy is available whenever we want it. But once we **only had candles**, they were used to lighten our homes before the industrial revolution. The fire by wood or coal provided heat for cooking food and for keeping us warm. Walking was then the only form of transport for most of the people. Since then, a vast array of energy devices and systems has been developed. These transform energy from sources **provided by nature** (coal, oil, gas, wind, sun and nuclear fuels) into other forms that we can use. As the population grows so do our energy demands. Startling facts confront us

**By the year 2050, world-wide energy demand is projected to be at least double its present level by the World Energy Council.**  
The most reliable predictions indicate that by 2050, the world's population will be nearly doubled from its present level. It will rise from

Projected growth in world population and energy consumption



around 6 billion to about 10 billion. Most of this growth, and much of the increase in energy consumption and demand, will occur in developing countries.

**Energy supply must be sustainable and diverse and Energy needs to be used more efficiently.**

A sustainable energy supply, both in the short and the long-term, is needed for promoting economic development, people's quality of life and **protecting the environment** as well. We also need a greater diversification of energy resources - if we are largely dependent on one fuel source, we risk price rises and supply disruptions.

Energy is a precious resource which must be conserved. **Improved energy efficiency**, therefore, in our homes, factories and transport needs to be strongly encouraged.

**Damage to the environment itself is a sufficient reason to promote alternative environment-friendly energy sources.**

Much of the global-scale environmental degradation today we see is, due to the **adverse effects of energy** production and use. The burning of fossil fuels produces carbon dioxide, one of the greenhouse gases. There is a growing concern about global warming, that these gases can cause. At present, fossil fuels produce most of our energy. Some energy comes from nuclear power stations and a small amount from renewable sources. Nuclear power and renewables **do not produce greenhouse gases**.

This highlights the need for working with dedication in the field of Environment and Energy. We, the members of **'The Group for Environment and Energy Engineering'** here at IIT Kanpur, do just the same. Our vision is to create solutions for the current energy and environment problems of the world such that smaller global entities can be energetically self-dependent. We work on practical problems and do hands on work with the institute association. Our projects include IIT Kanpur energy audit (Samadhan), solar experiments (GE3 has set up the solar experimental facility) and achieving cooling through solar heat and through CNG gas expansion (a patent project). The group members have attended **one international and three national level conferences** and have spoken at all of them. We are also involved in the various initiatives taken by IIT Kanpur in the field of energy and environment under the Golden Jubilee program e.g. campus solar lighting and the paper recycling project.

Apart from Technical aspects of research and conferences GE3 also organises courses and special lectures by experienced professionals. We have conducted a course on **Energy Efficiency** in December and by the time you will be reading this, a workshop consisting of some good lectures on **Rainwater Harvesting** would have been conducted. The videos of these events are archived and maintained in the GE3 resource section and can be accessed by anybody. Café Green is one of the recent initiatives of GE3, under this talks on relevant issues will be organised on a fortnightly basis. There are other projects which are under feasibility studies and can not be described here due to lack of space, we encourage you to contact us so that we can tell you about these projects and you can participate in a major way right from your first year! For more details visit [www.ge3.org](http://www.ge3.org), we will love to read your views on the forums for which you will have to register on the site. We hope that you will take an interest in these exciting fields which range from a rural application cantered bio-gas plant to multi million dollar ultra modern nuclear and thermal power plants. The work is technical, managerial, social (you can not even conceive how complex the energy and environment issues are at the social level), and that is to say there is opportunity for everybody! Contact us even while you are at home! We can not wait to hear from all our golden friends! See you at IIT Kanpur!

Contact us at [ge3.iitk@gmail.com](mailto:ge3.iitk@gmail.com)

### References

1. European Commission website [http://ec.europa.eu/research/energy/gp/gp\\_imp/article\\_1082\\_en.htm#1](http://ec.europa.eu/research/energy/gp/gp_imp/article_1082_en.htm#1)  
GE3 archives.

## Eyes on the Skies



It seems a gangrenous paw of the SnT frog has finally got rid of its gangrene. Long derided for doing “nothing”, the Astronomy Club, IIT Kanpur shed much of its old defunct image, when it successfully organized the 4 day long event “Eyes on the Skies” from 2nd April to 5th April, in association with UNSECO and the International Astronomical Union. This event is part of the programme “100 hours of Astronomy”, a global endeavor to bring Astronomy to the masses. The year 2009 has been declared the International Year of Astronomy by UNESCO.

The four day event included four lectures, observation sessions, quiz, planetarium, and screening of documentaries. The first lecture was by Mr Nilesh Vayada, noted amateur astronomer who spoke about observing solar eclipses, especially the total solar eclipse on July 22 this year. The next lecture was by Prof Tapobrata Sarkar, who spoke about stellar evolution, and the next lecture was by Prof HC Verma, who spoke about generation of elements inside stars. Shantanu Agrawal spoke about the Jugnu project, the nanosatellite mission of IIT Kanpur. He is the student head of the mission.

By far, the most successful part of the event were the night observation sessions. It drew a huge response from the students as well as the faculty. It was a chance for the club to flaunt its newly acquired state of the art 6 inch GO-TO telescope. Everyone was amazed to see the high resolution views of Saturn and the Moon. The Moon showed up in great detail, complete with craters and seas. So did Saturn, with its rings and the moon Titan. Other objects such as Orion Nebula and the Beehive Cluster were seen through the telescopes. But the star of the show was clearly the new Green Laser Pointer. You almost felt as if you held a very long Star Wars light saber. As many discovered, it was enormous fun to point it a star, distant object or simply a person.



The other events included screening of a documentary on the history of telescopes, which evoked a huge response. There was a quiz, and after five rounds full of facts and fun, the team of Saurabh Chaterjee and Tejaswi Venu Madhav emerged the winners. There was also a mini planetarium for all the campus residents. Buoyed by the success of the event, the Club has big plans for the future. With a dedicated team of 15 students, who worked for the event, the club plans to organise trips to national observatories, telescope making workshops and of course, observation sessions with the GO-TO telescope and the new green laser pointer. As Karthik, one of the Coordinators put it “We do it with a clear 'Objective'”.



## Call for the ARTICLES

NERD is the scientific and technical research and development magazine run by the students. We publish news on scientific breakthroughs happenings in various technical educational institutes, research labs etc. across India and the world with an emphasis on **the work done by students**. So NERD is a magazine of the students, by the students, for everyone. The NERD magazine is first of its kind and we need everyone who is interested in science and technology to be on our team. **Join the NERD Herd!** Yes, you can be the one writing for the magazine. There are a variety of things you can do :

- Write book reviews for popular science and technology books.
- Collect ideas for geeky cartoon strips and send them to us. You can also send illustrations and cartoons.
- Perform table-top science experiments and pen them down.
- Write about any science and technology related topic you are interested in.

Note that although articles related to science and technology are published, these articles are NOT papers but accurate versions written by students that are more easily understandable to non expert audience.

Visit <http://www.nerdmag.org/faq> for more answers

For author guidelines visit <http://www.nerdmag.org/resources/authors>

**NERD** magazine will release Volume 2 Issue 1 in August 2009. Interested people can send in entries for publication on or before July 10 '09 to [nerd@iitk.ac.in](mailto:nerd@iitk.ac.in). Contact us for query resolution. We will be happy to chat with you.

## Stepping Stones



Faez Ahmed

Faez Ahmed , a sophomore from Mechanical Engineering Department, pursued his summer internship in *Universiti Sains Malaysia (USM), Malaysia* with the USM Robotics Research Group. He worked there mainly on the design of an underwater pole inspection robot and tunnel inspection robot which was for the inspection of oil rig poles, that often corrode or crack and the divers face difficulty in going to a depth of 100 metres due to the gigantic pressure there. The tunnel inspection robot was to detect the corrosion and cracks inside the culverts (drains/channels crossing under a road). It faced problems of slipping and water proofing. We asked him what things got him so absorbed in robotics in his *first year itself*

In his first year, he attended all the lectures of Robotics Club and BRICS. He started preparing for Technokratics (the intra IIT-K Robotics Competition) but failed in his line follower robot. Fortune favours the brave, and so did it favour him. He finally made his first robot from lego kit- it was used to remove obstacles from the way. He continued participating and utilized his time in winters and worked on a wall climbing robot using PDMS adhesive with Dr. Ghatak which could climb up to 65 degrees but due to lack of time, the project was postponed.

Then came Techkriti'08 for which he had been preparing for 2 months. He made two robots:

1. *Battle of Atlantic*- It was a simple boat type robot which collected TT balls and threw them in basketball type goalpost.
2. *Saviour Sense*- It was a semi autonomous robot used to detect varying voltage and then press the switch if detected. He got the '*Best Design Award*' for this.

He was also selected for a summer internship at Middlesex University, London for aerial and ground robotics. The 5 shortlisted students were asked to submit videos demonstrating their work. His video was selected, but insufficient financial support did not permit him to go and learn there.

So, wonders can be created in short time, provided you decide that you have to create them.

-Attributed from NERD Volume 1 Issue 1



## Nerd Herd

**Editors:** Avirishu Verma, Parul Singh, Rishabh Chauhan,

Pranav Gupta  
**Artwork:** Prabha Malya, Puneet Singh

**Layout And Design:** Akash Rastogi, Utsav Kesharwani

**Team Members:** Bhuvnesh Goyal, Pranjal Nayak, Nikhil Upadhyaye, Harsh Shah, Shish Basu Palit, Kumar Devvrat, Parul Agarwal, Ish Dhand, Kumari Nisha, Ankita Panwar, Sanjay Nanda, Parnika Agarwal, Kritika Bhargav, Divya Chaudhary, Ranveer Singh, Abhas

ICARUS'10

## “Indian Conference for Academic Research by Undergraduate Students (26-28th March’10)”

The vision is to start an annual National Conference in order to provide a forum to communicate and celebrate undergraduate student achievements. The aim of the conference is to:

- Showcase and reward exceptional original research by undergraduate students, as well as the ability to communicate it.
- Provide participants, other individuals and organizations with information and exhibits to assist in the advancement of engineering and related arts and sciences.
- Increase awareness of current research and career options in science and technology among undergraduates.
- Continue a self-propagating system of Indian undergraduate conferences, to occur annually.