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AMEN

The Association of Mechanical Engineers

NEWSLETTER

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"Before God we are all equally wise – and equally foolish."

– Albert Einstein

From the President's Desk

We, on behalf of the Mechanical Engineering Department at IIT Kanpur, welcome you into a new world, a world of classes, of professors, of assignments, of machines, yet most importantly a world that'll let you choose, give you the freedom to decide for yourself. From now on, your decisions will pave your way and carve your destiny.

Into this world, you enter, and the AME helps you make those choices, gives you an insight into the matters that might perplex you. The AME works as an intermediary between the students and the faculty, helping them to voice their concerns and resolving any issues that might occur. It organizes industrial tours for students of the Mechanical Engineering Department to help them get a hands-on experience of what lies in the future. Visiting and permanent faculty give lectures on various topics, bringing us up to date about the current status of research in and outside of IIT Kanpur in numerous fields.

This year onwards, we are also planning to organize a few workshops on Robotics, Automobiles and other viable topics of interest. AME also sets up exhibitions during the technical festival of IITK, Techkriti, displaying the best BTPs and other projects developed during the course of the year by the students of the department, thus bringing to fore, their hard work and talent.

AME also helps the students find internships in their field of interest and also organizes freshers' and farewell functions for incoming and outgoing students. Senior junior informal interactions are held to guide the juniors regarding higher studies, placements, research topics, etc. Currently we are in a process of creating a database for opportunities in higher studies, placements and internships.

We hope to carry forward the tradition that has been set by our predecessors and expect your enthusiastic participation and support for the same. We are there to help you in case of any difficulty that might arise and we impress upon you not to hesitate in contacting us, if the need arises.

We wish you all the best for your stay in IIT Kanpur and hope that it turns out to be a pleasant experience that you'll cherish forever. So go ahead and embark on the journey called IITK!!

Prashant Saxena
President, A.M.E., UG COUNCIL

FRESHER SPEAKS !

Come 1st August and I boarded the train to live in the dreams which I had once seen. Reaching on 2nd August at 6:00 p.m., a shiver ran throughout my spine as I passed the gates of my dream destination --- IIT KANPUR.

After reporting at Hall-3, I was sent to the fabled and prestigious Hall-2. Inside the Hall office, the air was quite heavy. So to cool down myself, I carried a smile on my face, but was immediately warned by seniors to wipe it off in their presence. On reaching the room, I met my Student Guide. After meeting him, I felt if such were the seniors at IITK, then it definitely must be a great place to live in. During the orientation, we were promised a home away from home. At the Auditorium, it was great fun to have such sessions with the seniors, especially the on-stage performances by the freshers. But as soon as the interaction started in the hall premises, I discovered a different aspect of IITK. I was absolutely disillusioned and came to face the harsh reality. I found myself in a completely different situation. For the first 2-3 days, I thought the home which we were promised, was just some mad place where freedom, enjoyment and smiles were forcefully curbed. I felt lost in a hostile land away from the security, love and protection of my parents. Even the thoughts of fleeing propped up once or twice. But gradually, it dawned on me that this is what the world is like outside the circle of our families' love and caring. Soon I came to realize the fact that our seniors were actually trying to help us face and deal with the world. I realized that this interaction not only helped to break the ice between newcomers and old students but also made us understand life in a better way. It inculcated in us a sense of seriousness and maturity to deal with various situations. It actually helped us to open up and melt the ego factor within us. Though I still feel that at some point of time, something wrong had happened during the interaction but still the pros are much more than the cons. As days passed, the seniors became friendlier and we were finally assimilated into the IITK culture through the Freshers' Nite. Now I realize the importance and value of such interactions. A new world with a new outlook to live in – that's what I got from the interaction. I believe every fresher must be having his own story to narrate about IITK but what I just told you is my honest version.

Sandeep Kumar Mishra
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Did You Know

--TIME Magazine's Man of the Year in 1938 was Adolf Hitler.

--Only two in one thousand diamonds are considered truly colorless.

Molecular Simulation Students Group

The present day research is marked by bottom up approach i.e. using the atomic/electronic level information to reason out the response of different systems at higher length scales. Molecular simualations methods benifiting from the recent advancements in algorithms and computer hardware provides the neccesary tools for this approach. Also, the framework of molecular simulations can be usefull to various specialists to extract the respective information of their interests. With these advantages and with the motive of giving a new dimension to inter-disciplinary research cum collaborations and to create a bigger pool of young minds working in this area, recently a group naming "Molecular Simulation Students Group" has been formed. This group provides a platform and brings together all the students of IITK working (or willing to work) in the area of molecular/atomistic simulations e.g Ab-intio, Molecular-Dynamics, Monte-carlo simuations. This group establishes an informal learning platform where answer for any question would be seeked by fellow students by sharing their problems, experiences and expertise thus bringing up a lively learning atmosphere to gain better understanding of this simulation world. The working of the group is marked by fortnightly meetings on every first and third saturdays of every month from 9.30 p.m onwards at CAD LAB Seminar Room, Mechanical Engineering Department and through email based discussion board. At present, we have 30 student members ranging from postdoctoral fellows to bachelor students and from sciences to every engineering department. All interested students are welcome to join us in any of our meetings or email based discussion board by sending a mail to Dhiraj (dhiraj@iitk.ac.in), Research Scholar, Mechanical Engineering Department.

Dhiraj K. Mahajan

INTERNSHIP EXPERIENCE

Internship, if properly utilized, is one of the most important and easily accessible ways which is used by people to know their interests and decide where they want to land up. As soon as an IITian enters second year, he starts on planning about his interns and asking seniors about it. Some people even go for interns at end of second year. But in our department it's compulsory to go for interns after 3 year for a minimum period of 6 weeks. People predestine varied options for it and one of them is via SPO in Indian firms both Govt. sector and private sector.

Unlike my other fellows, I decided very early to go to Indian Air Force because I was always kind of attracted towards defense forces and thought of serving them at some period of my life. This was a vital period of time for me to decide where I want to land up after graduating from IIT and hence start preparing accordingly. All the applicants from IITK including 3 people from ME were granted the largest and oldest base repair depot of Indian Air Force that is 1BRD, Chakeri (Kanpur).

We landed there on 14th and our journey for an exciting 6 weeks period rocked off on 15th May. We were welcomed by the Air Officer Commanding (AOC) and then were sent to our BRD. 1BRD is the first-born BRD which looks after the backbone of Indian Air Force that is AN-32 which serves with IAF as transport cum bomber aircraft. Thereafter for one month we were told about various parts and facilities of AN-32 along with some introduction about engines of fighters including MIG-21, Jaguar and others. We were allowed actual hands-on on the plane, a rare experience not many enjoy in their respective lives.

The projects given to us dealt with realtime problems faced by IAF w.r.t. AN-32 which IAF was not able to sort out till now. We enjoyed working with officers who helped us a great deal. In between all this, we were introduced to Aeronautical Society of India (AeSI) and attended a seminar on "Non-Destructive Testing in IAF" in which scientists from HAL and others participated.

Perhaps the best part of the interns is that we were treated as officers all the way till the end and were allowed all services but the bar. The experience was as great and as memorable as it could have been, one of a kind. Eight weeks passed by so quickly that it was hard to realize and we returned to our respective places with bountiful satisfaction and a nostalgic feeling. We had been the part of perhaps the most elite and highly respected family for the 8 most fascinating weeks of my life.

Vivek Gaur Vats
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Biomechanics–Expanded horizon of mechanical engineering

Biomechanics is the research and analysis of the mechanics of living organisms. Some simple examples of biomechanics research include the investigation of the forces that act on limbs, the aerodynamics of bird and insect flight, the hydrodynamics of swimming in fish and locomotion in general across all forms of life. Applied mechanics, most notably thermodynamics and continuum mechanics and mechanical engineering disciplines such as fluid mechanics and solid mechanics, play prominent roles in the study of biomechanics. Few research topics have been introduced here.

Biomechanics of Circulation: Under most circumstances, blood flow can be modeled by the Navier-Stokes equations. Whole blood can often be assumed to be an incompressible Newtonian fluid. However, this assumption fails when considering flows within arterioles. At this scale, the effects of individual red blood cells become significant, and whole blood can no longer be modeled as a continuum.

Biomechanics of the bones: Bones are anisotropic but are approximately transversely isotropic. They are stronger along one axis than along others. The stress-strain relations of bones can be modeled using Hooke's Law, using appropriate values of Young's modulus, shear modulus and poission ratio. The constitutive matrix, a fourth order tensor, depends on the isotropy of the bone.

$$\sigma_{ij} = c_{ijkl} \in_{kl}$$

Nonlinear Theories: In recent years, Nonlinear Theories are being used to capture the tissue behavior. Some common material models include the Neo-Hookean behavior, often used for modeling elastin (a highly elastic protein in connective tissue), and the famous Fung-elastic exponential model. Non linear phenomena in the biomechanics of soft tissue arise not only from the material properties but also from the very large strains (100% and more) that are characteristic of many problems in soft tissues.

Few applications:

Biomechanics as a Sports science applies the laws of mechanics and physics to human performance, in order to gain a greater understanding of performance in athletic events through modeling, simulation and measurement.

Joint Replacement and Tissue Substitution

The biggest challenge to the orthopedic industry lies in producing joint replacement with less wear and longer osteolysis free lifetimes. A range of new materials and designs are now being investigated with the aim of producing engineering solutions with significantly reduced wear particle generation.

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