

Faculty

- ✦ **Agarwal A K** : IC Engines, Alternative fuel & Oil tribology
- ✦ **Banerjee B N** : Aerostatic bearings
- ✦ **Basu S** : Fracture Mechanics, Micromechanics
- ✦ **Bhattacharya B** : Smart Composites, MEMS
- ✦ **Bhattacharya S** : BioMEMS, Lab-on-chip, Nanotechnology
- ✦ **Biswas Gautam** : CFD, Heat transfer, Turbulence
- ✦ **Choudhury S K** : Vibration Control of Machine Tools
- ✦ **Dasgupta Bhaskar** : Robotics, CAD, Scientific Computing
- ✦ **Deb Kalyanmoy** : Genetic algorithms, Optimization
- ✦ **Dhande S G** : CAD, Rapid prototyping
- ✦ **Dixit P M** : FEM in plasticity
- ✦ **Dutta A** : Automation, Control
- ✦ **Eswaran V** : CFD, Turbulence
- ✦ **Ghosh A** : Robotics, Manufacturing
- ✦ **Ghoshdastidar P S** : Computational heat transfer
- ✦ **Hatwal H** : Vibrations
- ✦ **Jain V K** : Unconventional machining, CAM
- ✦ **Kalra M S** : Reactor dynamics
- ✦ **Kar K K** : Polymers, Materials
- ✦ **Khandekar S** : Heat pipes, Dropwise condensation
- ✦ **Kishore N N** : Composite materials, Dynamic fracture mechanics
- ✦ **Kumar Prashant** : Polymer composites, Fracture
- ✦ **Mahesh S** : Composites, Micromechanics
- ✦ **Mallik A K** : Kinematics, Vibrations
- ✦ **Munshi P** : Computer aided tomography
- ✦ **Muralidhar K** : Laser instrumentation, Hierarchical porous Media
- ✦ **Panigrahi P K** : Flow control, PIV
- ✦ **Pundir B P** : IC Engines, Emission control, Fuels
- ✦ **Ramkumar J** : Manufacturing science, Condition monitoring, Composite materials
- ✦ **Reddy N V** : Manufacturing science, CAD/CAM, RP/RT
- ✦ **Saha A K** : Gas hydrates, Vortex dynamics, industrial CFD
- ✦ **Sarkar Subrata** : Turbomachinery
- ✦ **Saxena Anupam** : CAD, Optimization Compliant Mechanisms, MEMS, Large Analysis
- ✦ **Sengupta A** : Nonlinear analysis and chaos, Nuclear engineering
- ✦ **Sharma B L** : Theoretical and Applied Mechanics, Analytical Techniques
- ✦ **Sharma Ishan** : Mechanics of Granular Media, Planetary Science
- ✦ **Venkitanarayanan P** : Experimental stress analysis Dynamic behavior of Materials
- ✦ **Vyas N S** : Vibrations, Condition monitoring
- ✦ **Wahi Pankaj** : Nonlinear Dynamics, Vibration

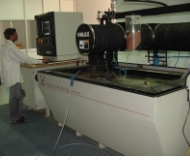
Contact Head

Department of Mechanical Engineering
Indian Institute of Technology Kanpur
Kanpur-208016
INDIA

Tel: (0512)-2597627
Fax: (0512)-2597408
Email: head_me@iitk.ac.in

Indian Institute of **IITK** Technology Kanpur

Mechanical Engineering



One of the founding departments of IIT Kanpur, the Mechanical Engineering Department played a leading role in evolving an "Engineering Science" based curriculum, and served as a role model for many academic institutes in the country. Over the years, interaction with industry and the emphasis on applied engineering has increased and today the annual external funding in the department runs to more than two crores, of which about Rs.50 Lakhs is in industrial consultancy. Two major mission projects, from Railways and Department of Atomic Energy respectively, are currently in progress. Working groups on sensors and actuators, microengineering, applied mechaenics and futuristic energy technology have been constituted.

The world of mechanical engineering is vast. Changes are driven by the influence of advanced computational tools, vastly improved simulation and analysis, and entirely different measurement and manufacturing protocols. This has opened up new lines of research in the department, such as Rapid Prototyping, Smart Materials and Structures, Virtual Reality Modeling, Laser instrumentation, Computational heat transfer, Genetic algorithms, Nanomaterials, Bio-MEMS and non-invasive measurements. Each year, the department graduates 60 B.Tech.s, 15 dual-degree, 60 M.Techs, and 5 to 10 Ph.Ds. The faculty strength is currently 37.



Areas of Research

- ✦ *Solid Mechanics and Design*
- ✦ *Fluid Mechanics and Thermal Sciences*
- ✦ *Manufacturing Science*
- ✦ *Mechatronics*
- ✦ *Microengineering*

New Facilities

- ✦ *Dynamic Mechanical and Thermal Analyzer*
- ✦ *Stereoscopic Particle Image Velocimetry System*
- ✦ *Horiba Exhaust Emission Analyzer*
- ✦ *3D Laser Doppler Velocimeter*
- ✦ *24-node, dual processor, high end computing platform*
- ✦ *Universal Micromachining Center*

Facilities Available

- ✦ Prepreg Machine
- ✦ Rapid Prototyping FDM 1650, Cubital
- ✦ 24 node high end cluster
- ✦ 10 Ton MTS
- ✦ Workstations for CAD/CAM & CFD
- ✦ CNC Turning Machine
- ✦ 3-Axis CNC Milling Machine
- ✦ AFM, AJM, EDM, ECM
- ✦ Liquid Crystal Thermography
- ✦ 3 Channel hot-wire Anemometer
- ✦ Stereoscopic Particle Image Velocimetry
- ✦ Laser Interferometer and Laser Schlieren System
- ✦ Hybrid Air-conditioners
- ✦ PUMA-560 Manipulator
- ✦ Reverse Engineering, Faroarm-Silver & Surfacar
- ✦ Zeta Potentiometer
- ✦ Injection Molding Machine
- ✦ Laser Based Ultrasonic NDT System
- ✦ Coordinate Measuring Machine
- ✦ Smart Laminator Test Set-up
- ✦ Engine-dynamometer Test Beds
- ✦ Raw Exhaust Emission Analyzer

Books

- ✦ *Applied Mathematical Methods*, Bhaskar Dasgupta, Pearson Education, (2006).
- ✦ *Computerized Tomography for Scientists and Engineers*, P. Munshi (editor), CRC Press jointly published by Taylor and Francis, New York and Anamaya Publishers, New Delhi (2006).
- ✦ *Chaos, Nonlinearity, Complexity, The Dynamical Paradigm of Nature*, A. Sengupta (Editor) Springer-Verlag, Berlin Heidelberg, (2006).
- ✦ *Alternative Fuels and CI Engine Performance*, Editors: Avinash K. Agarwal, G. J. Thompson, SP-2067, SAE International, USA, (2007).
- ✦ *Engine Emissions: Pollutant Formation and Advances in Control Technology*, B.P. Pundir, Narosa Publishing House, New Delhi (2007).
- ✦ *Czochralski Growth of Oxide Crystals, Numerical Simulation and Experiments*, J. Banerjee and K. Muralidhar, Techscience Press, Georgia, USA, (2007).
- ✦ *Turbulence Control (Microflaps, Microballoon, Microsynthetic jet)*, *Encyclopedia of Micro and Nano Fluidics*, Editor: D. Li P.K. Panigrahi, Springer Publications, (2007).
- ✦ *Stability Problems in Applied Mechanics*, AK Mallik and J K Bhattacharjee, Narosa, (2005)
- ✦ *Fundamentals of Manufacturing Processes*, G K Lal and S K Choudhury, Narosa, (2005)
- ✦ *Machining Technology*, V.K. Jain, Indira Gandhi National Open University, New Delhi (2007).
- ✦ *Heat Transfer*, P S Ghoshdastidar, Oxford University Press, (2004)
- ✦ *Advanced Engineering Fluid Mechanics*, K Muralidhar and G Biswas, Narosa, (2004)
- ✦ *Turbulence: Modelling and Measurements*, G Biswas and V Eswaran (eds), , Narosa, (2002)
- ✦ *Multi-objective Optimization using Evolutionary Algorithms*, K Deb, Wiley, (2001)



Major Facilities

- ✦ ATOS Scanner in CAD Lab
- ✦ Mach-Zehnder interferometer, laser and colour schlieren systems, stereo and micro-PIV
- ✦ Computerized Zwick Universal Testing Machine
- ✦ Universal Micro-machining Centre



Laboratories

- ✦ CAD/CAM
- ✦ Condition Monitoring
- ✦ Fluid Mechanics
- ✦ Genetic Algorithms
- ✦ Heat Transfer
- ✦ High Strain Rate
- ✦ I.C. Engines
- ✦ Manufacturing
- ✦ Mechatronics
- ✦ NDT
- ✦ Optical Instrumentation
- ✦ Photo elasticity
- ✦ Polymer Composites
- ✦ Rapid tooling
- ✦ Rapid prototyping
- ✦ Reverse Engineering
- ✦ Smart Materials & Structures
- ✦ Tomography
- ✦ Turbulence Measurement
- ✦ Turbomachinery

Research Projects

Sponsoring Agencies : UNDP, NSF, DST, CSIR, BRNS, AR&DB, DRDO, AERB, CSIR, ADA, TDM, CST, MHRD, CPCB, KVIC and many others. Name of typical projects:

- ✦ Drop-wise Condensation on an Inclined Surface Exposed to a Vapor Flux
- ✦ Experiments in active control of body drag using schlieren velocimetry technique
- ✦ Development of a robust general purpose CFD solver
- ✦ Development of Genetic Algorithms for Engineering Design
- ✦ Simulation of Manufacturing Process
- ✦ Knowledge Based Process Planning System for Axi Symmetric Deep Drawing
- ✦ Oil-Water Flow through Porous Media
- ✦ Heat Transfer Enhancement by Acoustically Generated Vortices and Perforated Ribs
- ✦ Study of Bird Impact on an Aircraft Windshield
- ✦ Residual Stresses and an Isotropic Effects in Forging and Shell Metal Forming
- ✦ Study of Electrical Discharge Diamond Grinding
- ✦ Electrical Discharge Abrasive Grinding
- ✦ Automated CAPP of Advanced Machining Process
- ✦ Development of Smart Composite Structures
- ✦ Inter-laminar Toughness of FRP Laminates Under Impact Loading
- ✦ Integrated Design and Competitive Manufacturing
- ✦ Development of Laser based Ultrasonic NDT system
- ✦ Hybrid Fused Deposition Modelling
- ✦ Engine Emission and Control, Alternative Fuels
- ✦ Application of Vortex Generators and Oval Tubes for Enhancement of Heat Transfer In Air-cooled Condensers



Selected Publications

- ✦ Estimation of fracture parameters and stress field for edge cracks in finite elastically graded plates using boundary collocation, *Acta Mechanica*, Vol. 184, 2006, 159-170, V. Parameswaran and S. Sharma.
- ✦ Large-Eddy Simulation of Unsteady Surface Pressure on a LP Turbine Blade due to Interactions of Passing Wakes and Inflexional Boundary Layer, *ASME Journal of Turbomachinery*, Vol. 128, 2006, pp. 221-231, S. Sarkar and P.R. Voke.
- ✦ A Three-dimensional Numerical Modeling of Atmospheric Pool Boiling by the Coupled Map Lattice Method, *ASME Journal of Heat Transfer*, Vol. 128, 2006, pp. 1149-1158, A. Gupta and P.S. Ghoshdastidar.
- ✦ Deformation banding and shear banding in single crystals, *Acta Materialia*, Vol. 54, pp. 4565-4574, 2006, S. Mahesh.
- ✦ An Active Vibration Control Strategy for a Flexible Link Using Distributed Ionic Polymer Metal Composites, *Smart Materials and Structures*, Vol.16, 2007, pp. 617-625. D. Bandyopadhyay, B. Bhattacharya, A. Dutta.
- ✦ Path planning for a statically stable biped robot using PRM and Reinforcement learning, *Journal of Intelligent and Robotic Systems*, Vol. 47, 2006, pp. 197-214, P. Kulkarni, D. Goswami, P. Guha and A. Dutta.
- ✦ Hydrogen addition to acetylene-air laminar diffusion flames: Studies on soot formation under different flow arrangements, *Combustion and Flame*, Vol. 148, 2007, pp 249-262. P. Pandey, B.P. Pundir and P.K. Panigrahi.
- ✦ 1. Sensitivity of a square cylinder wake to forced oscillations, *ASME Journal of Fluids Engineering*, Vol. 129, pp. 852-870, 2007, S. Dutta, P.K. Panigrahi and K.Muralidhar.
- ✦ Three-Dimensional Numerical Study of Flow and Heat Transfer from a Cube Placed in a Uniform Flow, *Int. J. Heat Fluid Flow*, Vol. 27, 2006, pp. 80-94, A.K. Saha.
- ✦ Thermal Hydraulics of the Spallation Target Module of an Accelerator Driven Sub-critical System: A Numerical Study, *International Journal of Heat and Mass Transfer*, Vol. 49, 2006, pp. 4633-4652, K. Arul Prakash, G. Biswas and B.V. Rathish Kumar.
- ✦ Experimental investigation of the response of a harmonically excited hard Duffing oscillator, *Pramana: Journal of Physics*, 68 (1), 2007, pp. 99-104, N. S. Patil and A. K. Mallik.
- ✦ Virtual Hybrid-FDM System to Enhance Surface Finish, *Virtual and Physical Prototyping*, *International Journal*, Vol. 1, 2006, 101-116, P.M. Pandey, N.V. Reddy and S.G. Dhande.
- ✦ Self Catalyzing Behaviour of Kanthal Wire for Coating of Carbon Nanotubes, Fullerenes, Nanotubes and Carbon Nanostructures, Vol.16 (1), 2008, pp.78-87, A. Rahman, N. Patra and K.K. Kar.
- ✦ Bio Fuels (Alcohols and Biodiesel) Applications as fuels for Internal Combustion Engines, *Progress in Energy and Combustion Science*, Vol. 33, 2007, pp. 233-271, A. K. Agarwal.
- ✦ On simulation of magnetic abrasive finishing process for plane surfaces using FEM, *International Journal of Machining and Machinability of Materials*, Vol. 1, 2006, pp. 133-165, G.B. Madhab, V.K. Jain and P.M. Dixit.
- ✦ A molecular dynamics study on the strength and ductility of high Tg polymers, *Modell. Simul. Mater. Sc. Engng.*, Vol. 14, pp. 563, 2006, A.K. Negi and S. Basu.