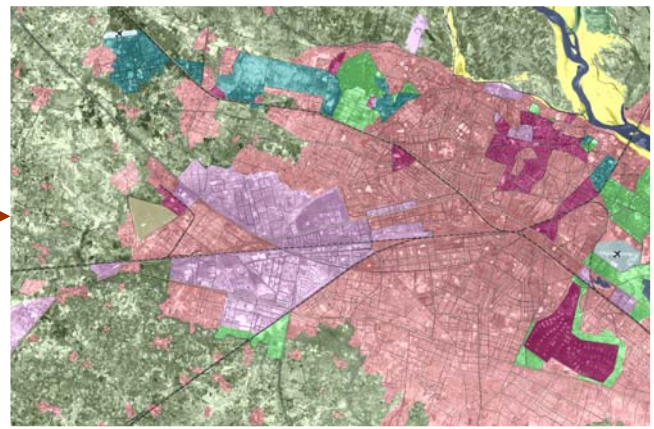
Department of

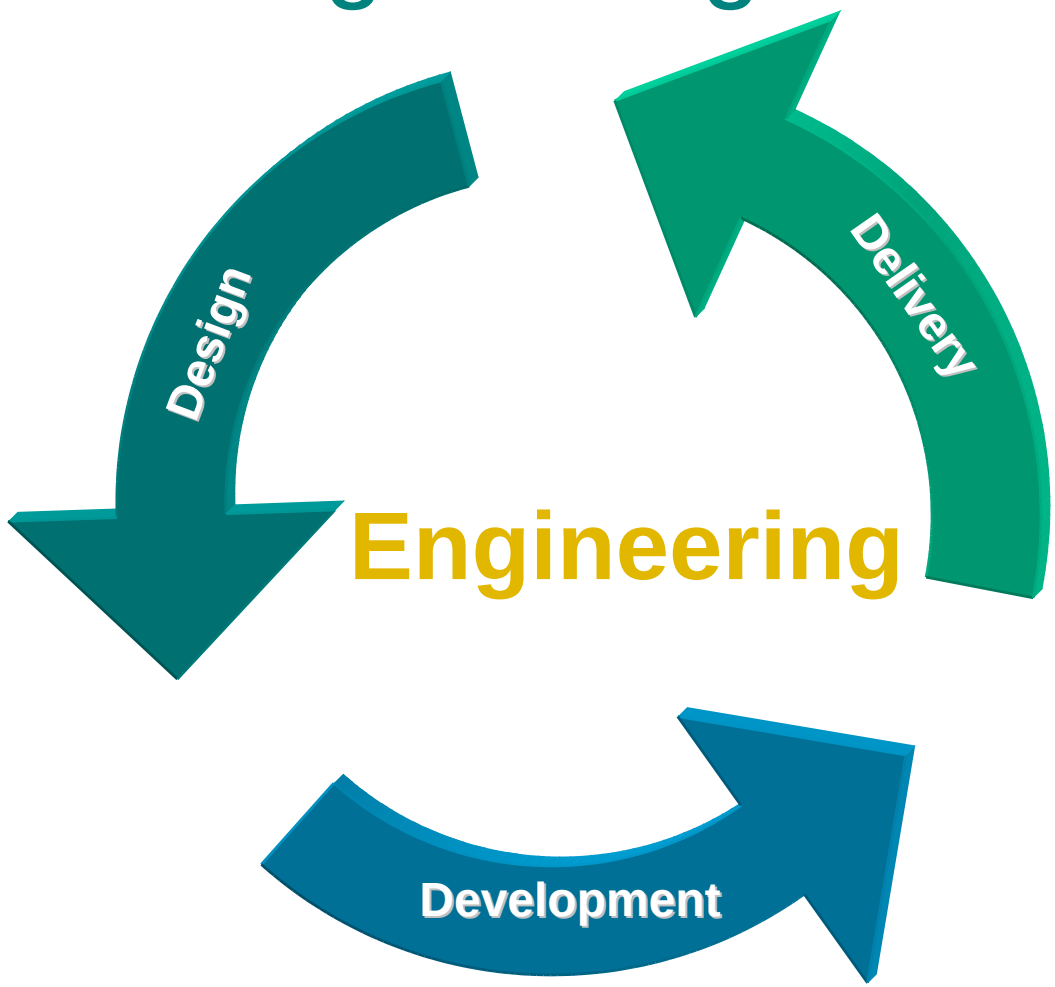
Mechanical Engineering

IIT Kanpur

Mechanical Engineering Department



What is Engineering?



Excitements in Mechanical Engineering

Excitements in Mechanical Engineering

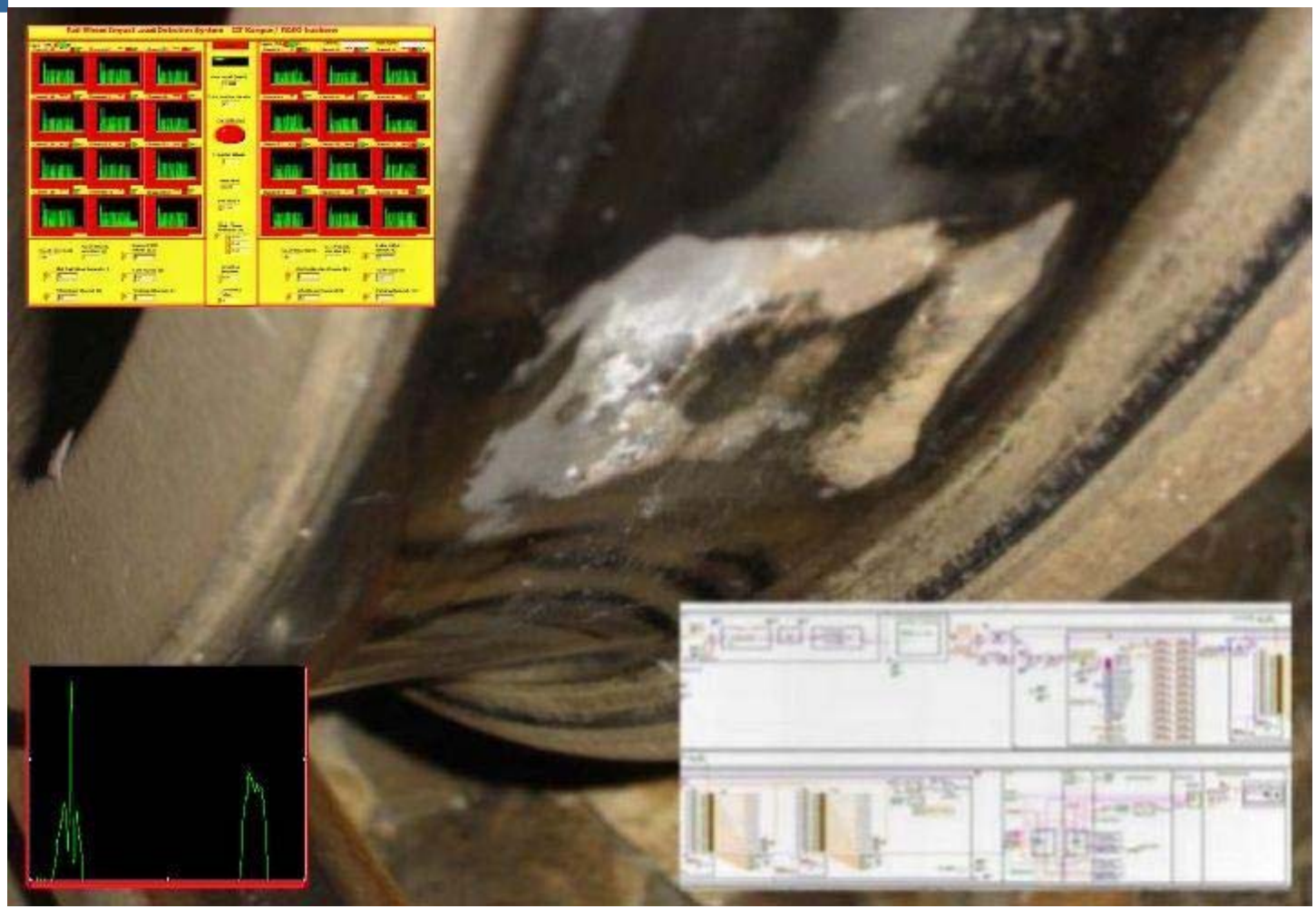
- Make engines, machines, robots
- Generate energy and power
- Explore and understand applicable science
- Create new materials

Indian Railways

Indian Railways

- Wheel Impact Load Detection System (WILD)
- Derailment Detection Devices
- Measuring Wheel Technology
- Onboard Diagnosis
- Bogie Design

Indian Railways



Wheel Impact Load Detection System (WILD)

Indian Railways

Wheel Impact Load Detection System (WILD)

A prototype automated system for On-Line estimation of Wheel Impact Loads and detection of Wheel Flats of running trains has been developed.

The Instrumentation System consisting of both Hardware and Software components has then been rigorously field tested at Ajgain Railway Station, near Lucknow for more than two years.

Strain-Guage Technology has been employed and data is collected over 24-channels along a rail length of five meters. Intelligent software algorithms and codes have been developed and embedded into the hardware processors.

For more Details visit site: *Wheel Impact load Detection System (WILD)*

Indian Railways

Derailment Detection Devices

Derailment Mechanism

Laboratory Tests

Lab Brake Mechanism

Placement of Sensors

Indian Railways

Derailment Detection Devices

This project envisages development of On-Board equipment for sensing derailment possibilities of rolling stock. Development includes appropriate instrumentation and signal processing strategy and its integration with the existing brake mechanism for minimizing losses due to dragging of derailed vehicle. Presently there is no instrumentation on Indian Railways for detecting derailment possibilities.

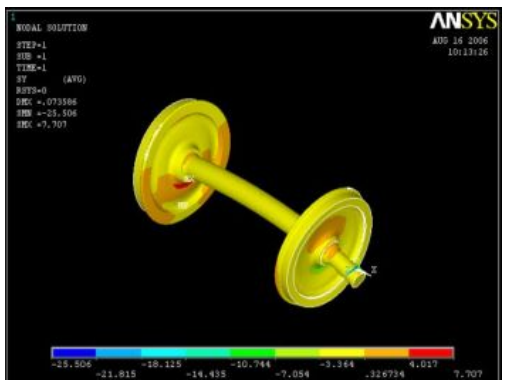
For more Details visit site: *Technology Mission on Railway Safety (TMRS)*

Indian Railways

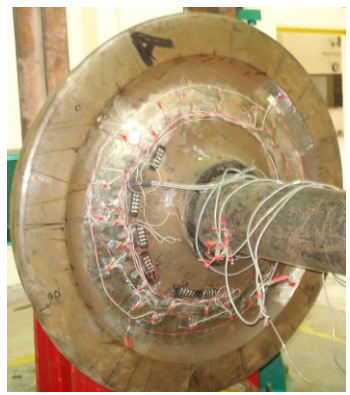
Measuring Wheel Technology

Measuring Wheel Experimental Setup

Data Acquisition



FEM of the Wheel Axle Set



Instrumented Wheel

Indian Railways

Measuring Wheel Technology

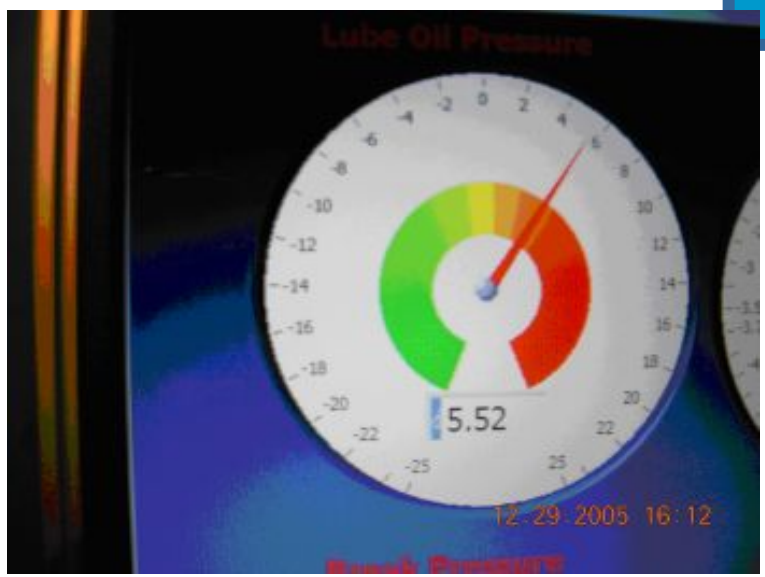
Development of an instrumented wheel is important for a variety of safety related reasons. The project Measuring Wheel Technology is expected to serve as a major tool for carrying out studies on rail-wheel interactive forces, derailment analysis, wheel profile optimization, bogie hunting etc. Measuring Wheel is also essential for analysis of various types of stresses coming on rail and wheels during introduction of any new rolling stock in Indian Railways.

For more Details visit site: *Technology Mission on Railway Safety (TMRS)*

Indian Railways

Onboard Diagnosis

Pressure Transducer



Brake Pipe Pressure Indicator

Indian Railways

Onboard Diagnosis

The objective of the project is to develop an On-board Diagnostics for Diesel and Electric locomotives through a network based real time control system.

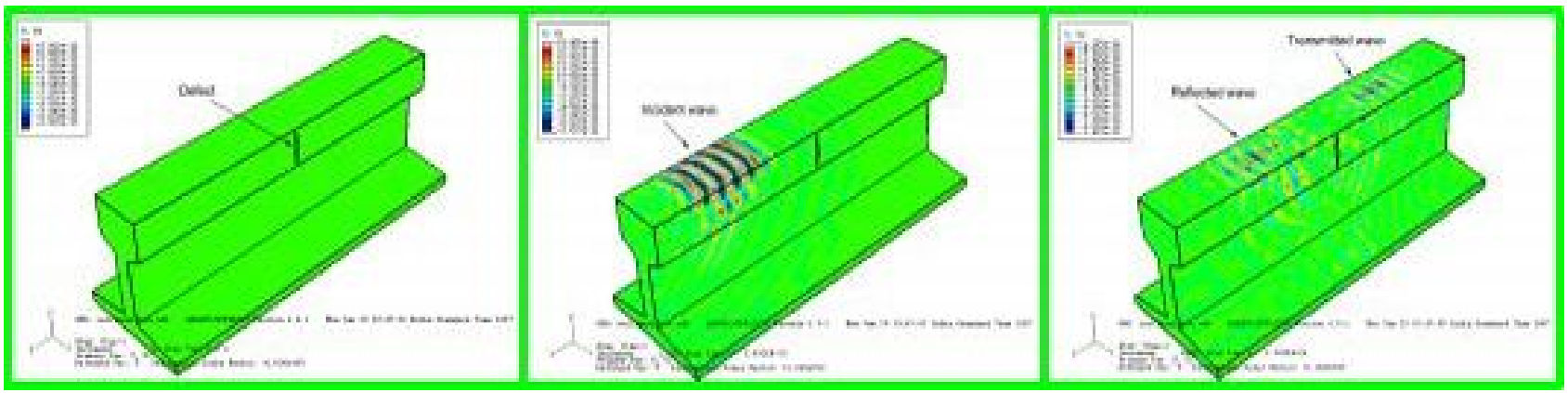
Diagnostics on existing locomotives is presently confined to the trouble shooting knowledge of the driver. The exercise includes development of appropriate instrumentation and signal processing strategy for various equipments which form part of the transmission and also for other auxiliary machines on board the locomotives.

For more Details visit site: *Technology Mission on Railway Safety (TMRS)*

Indian Railways

Rail Flaw Detection Instrumentation

Defect on Rails



Simulation Studies

Indian Railways

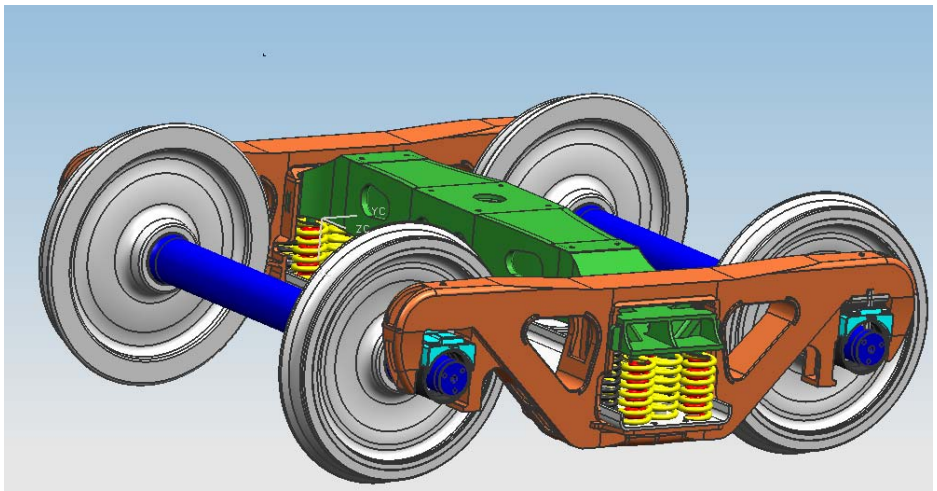
Rail Flaw Detection Instrumentation

Different types of rail flaws include: Transverse defect in rail head, Gauge face corner defect, Rail weld defect (AT weld), Bolt hole defect, Piping defect, Half moon cracks at the weld etc. It is evident that rail flaw detection instrumentation would require multiple probing activities. The objective is to build a state of art of non-contact type ultrasonic testing methodology to detect various rail defects; to develop a semi-automatic system (double rail tester); to develop methodologies for online and off-line post processing of data. The instrument vehicle will be operable manually at walking speed as well as speeds upto 50 kmph. An instrumentation system based on Electro Magnetic Acoustic Transducer (EMAT) technology is being developed to meet the requirements of high speed testing and data logging.

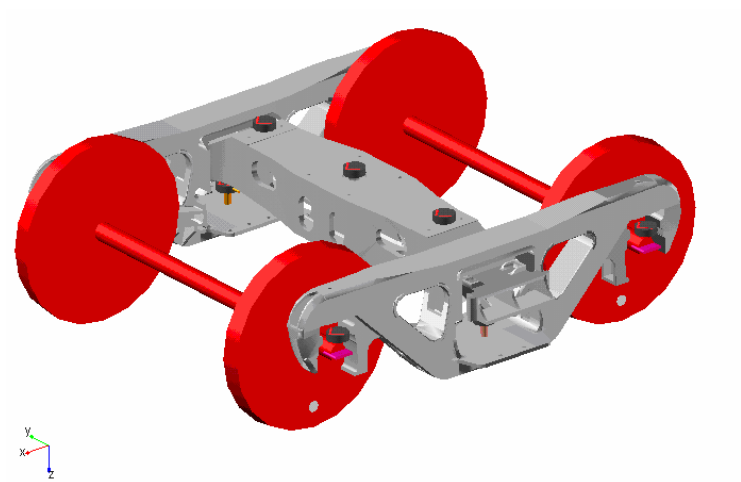
For more Details visit site: *Technology Mission on Railway Safety (TMRS)*

Indian Railways

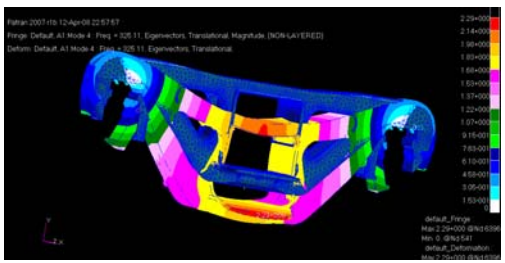
Bogie Design

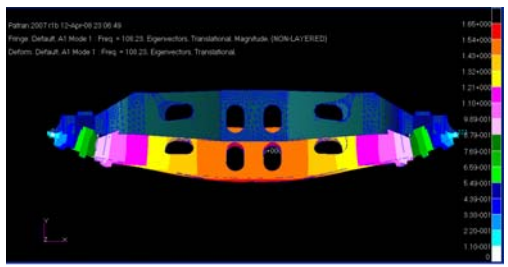


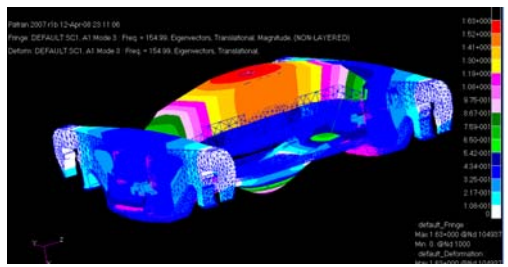
CASNUB bogie Assembly



Model of CASNUB bogie in ADAMS







Finite element analysis of some wagon components

Indian Railways

Bogie Design

Indian Railways is the backbone for the economic development in our country. Freight movement is the major activity of revenue generation in Indian Railways. With increasing speed and load carrying capacity the need for safety in operation of the railway vehicle has become very much essential in the present era. This requires modification of existing component or new design to give improved service condition with reliability for maximum use of vehicle and better economy.

Indian Cars

Indica

Scorpio

Indian Cars

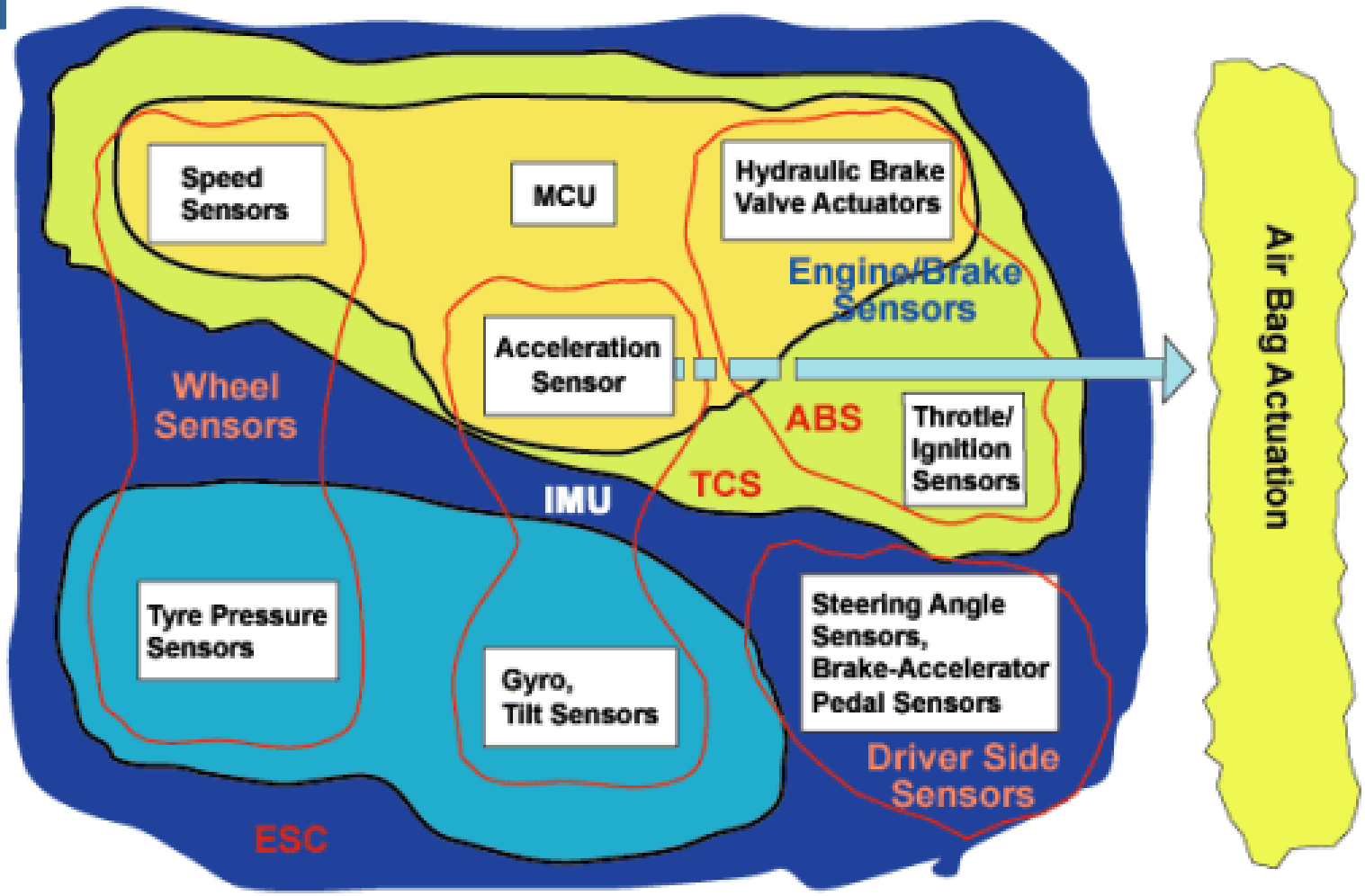
MEMS based Electronic Stability Program for Automotive Applications

The objective of this program is to develop a MEMS sensor based control system that will enhance the stability of vehicles on Indian roads.

The program comprises of development of electro-mechanical systems for providing safety against problems situations like wheel-locking, traction instabilities, roll over, oversteer, understeer etc.

For more Details visit site: *Electronic Stability Program*

Indian Cars



ESC - Electronic Stability Control

For more Details visit site: *Electronic Stability Program*

Indian Cars

Transmitter

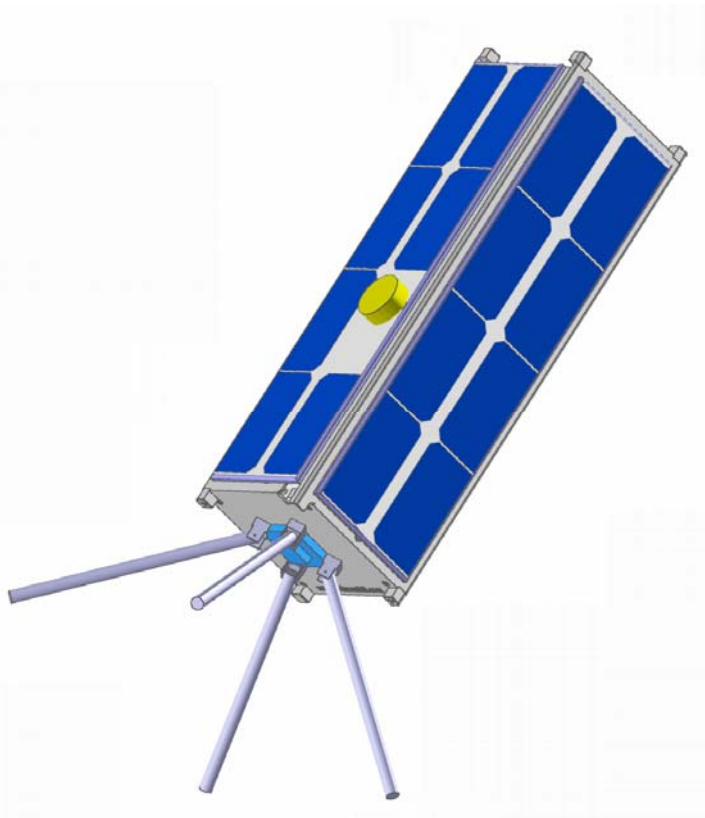
Wireless Receiver

Wireless Receiver

ABS Lab Model

For more Details visit site: *Electronic Stability Program*

India’s First IITK Nano Satellite

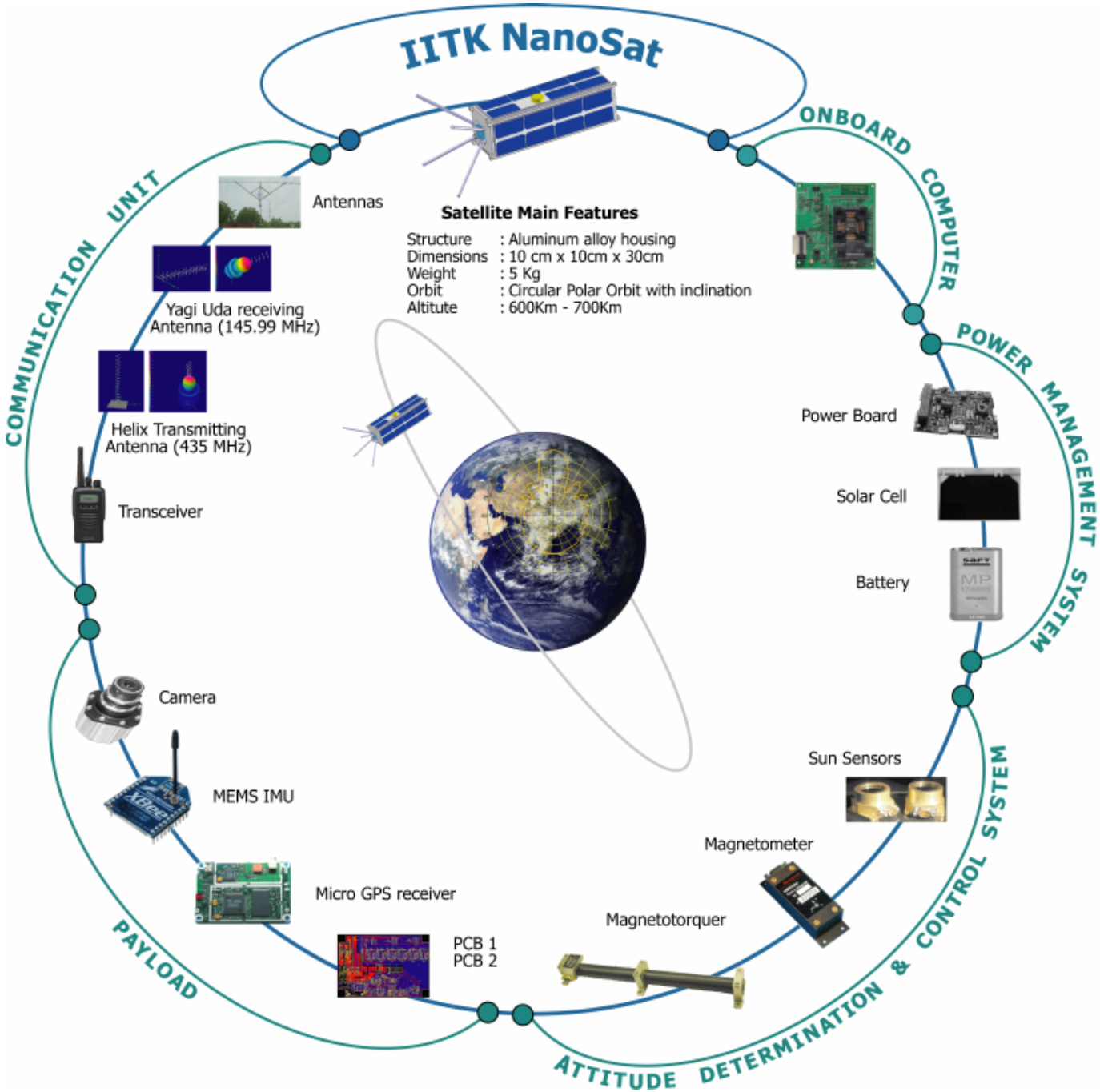


IITK Nano Satellite

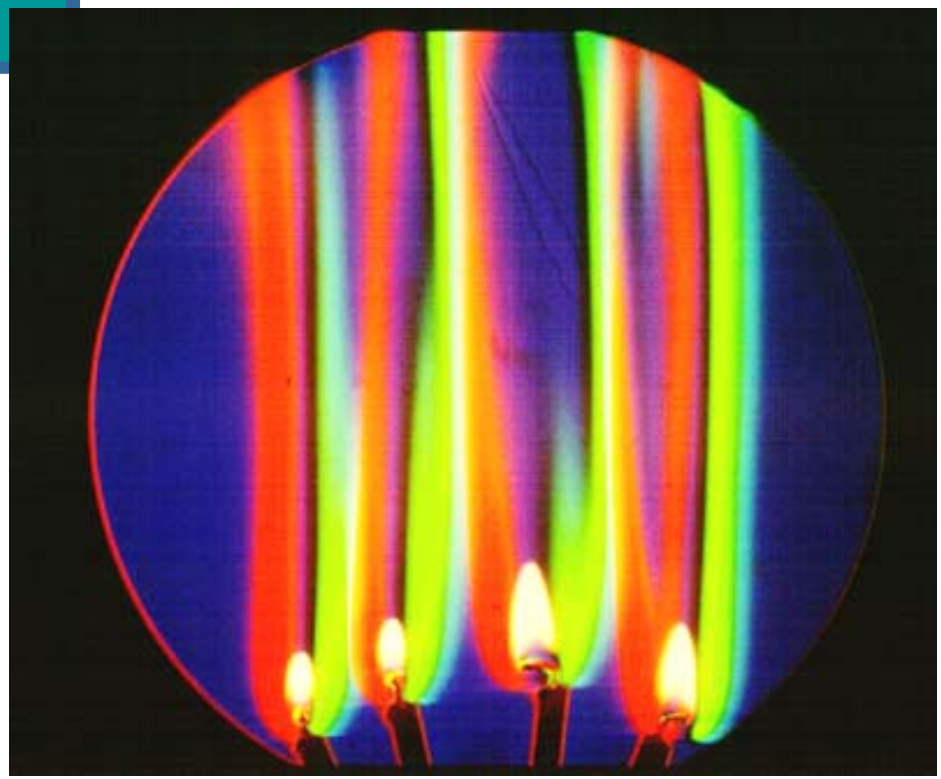
India's First IITK Nano Satellite

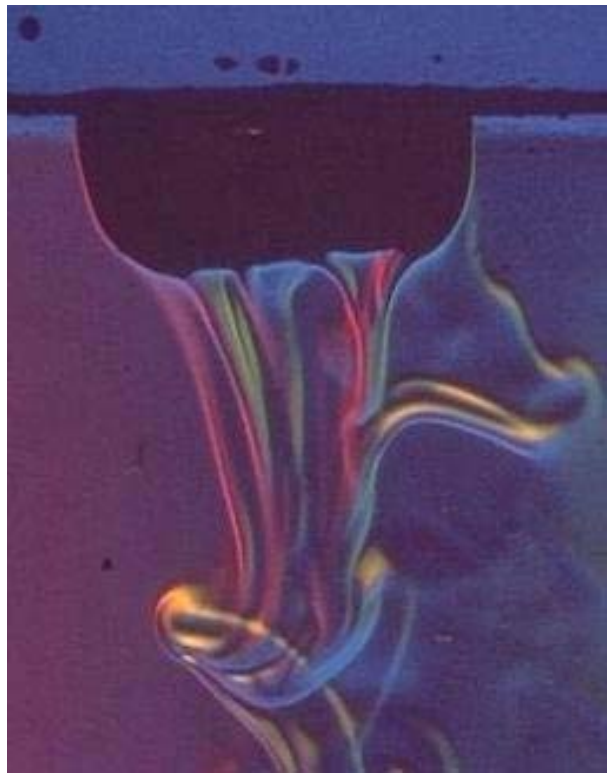
Satellite Main Features

Satellite	**:**	**5 Kg**
Satellite Dimensions	**:**	**10 cm x 10cm x 30cm**
Orbit	**:**	**Circular Polar Orbit with inclination**
Altitude	**:**	**600Km-700Km**
Satellite structure	**:**	**Aluminium alloy housing**
On-Board Computer	**:**	**TS 7260 board with ARM 9 processor**
Operating System	**:**	**Salvo Pro**
Attitude Sensing	**:**	**3-axis magnetometer, 2-axis sun sensor**
Attitude control	**:**	**Magnetorquer**
Thermal Control	**:**	**Passive, radiators on 2 faces**
Power	**:**	**Body Mounted Solar cells generating an average power of around 5W. Li-ion cells to give power to satellite during eclipse**
Communication	**:**	**UHF-436.7 MHz, VHF-145.99 MHz**
Ground Station	**:**	**Setup at IIT Kanpur UHF/VHF communication link, 2-axis tracking antenna**
Payload	**:**	**Micro GPS receiver MEMS IMU Imaging**

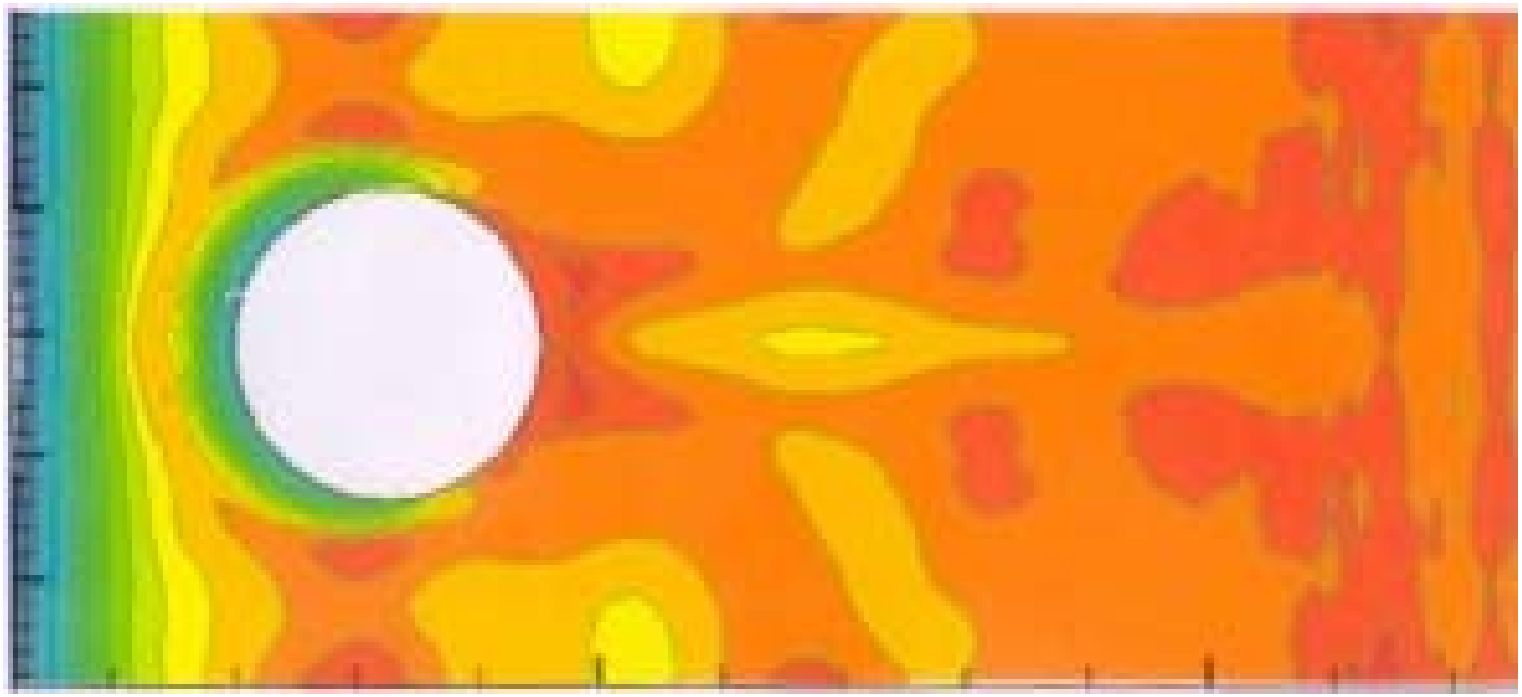

IITK NanoSat
Satellite Main Features
Structure : Aluminum alloy housing
Dimensions : 10 cm x 10cm x 30cm
Weight : 5 Kg
Orbit : Circular Polar Orbit with inclination
Altitute : 600Km - 700Km
COMMUNICATION UNIT
Antennas
Yagi Uda receiving Antenna (145.99 MHz)
Helix Transmitting Antenna (435 MHz)
Transceiver
ONBOARD COMPUTER
POWER MANAGEMENT SYSTEM
Power Board
Solar Cell
Battery
ATTITUDE DETERMINATION & CONTROL SYSTEM
Sun Sensors
Magnetometer
Magnetotorquer
PAYLOAD
Camera
MEMS IMU
Micro GPS receiver
PCB 1
PCB 2

Color Schlieren Images

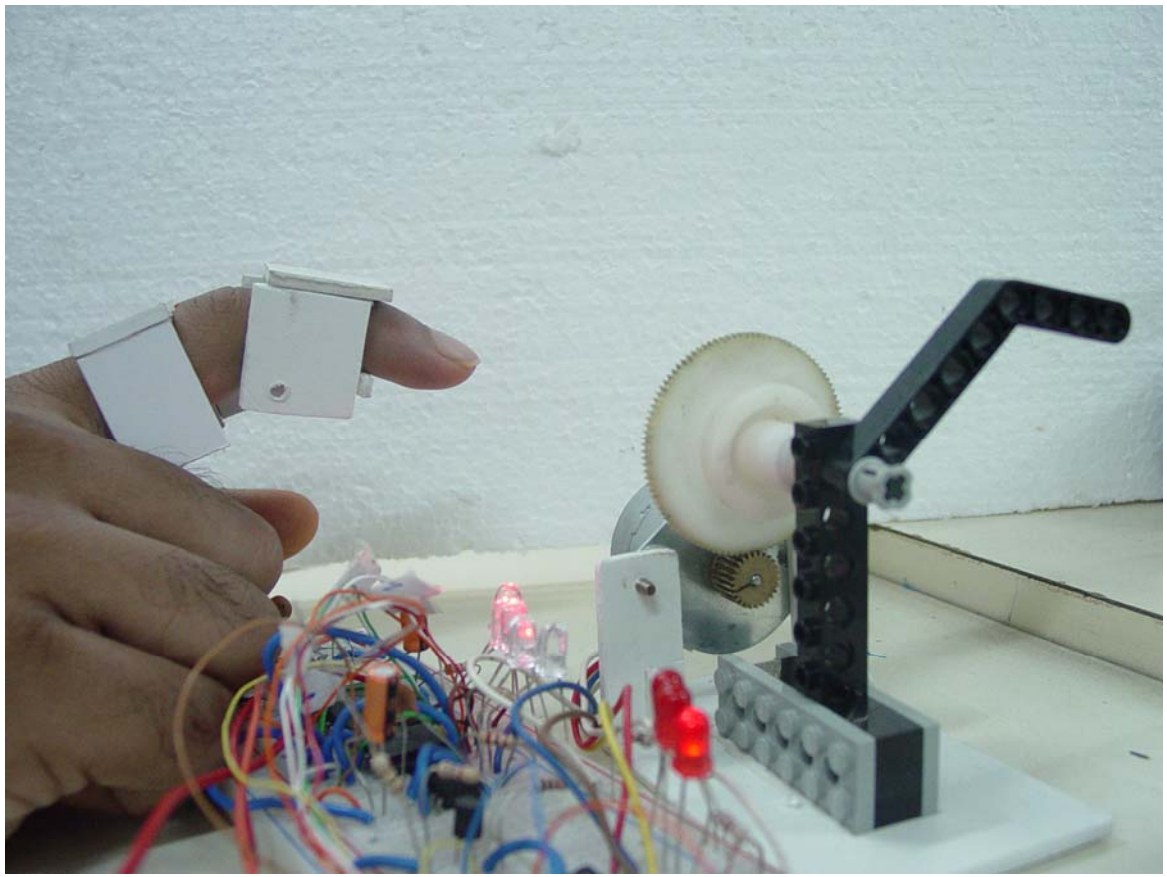




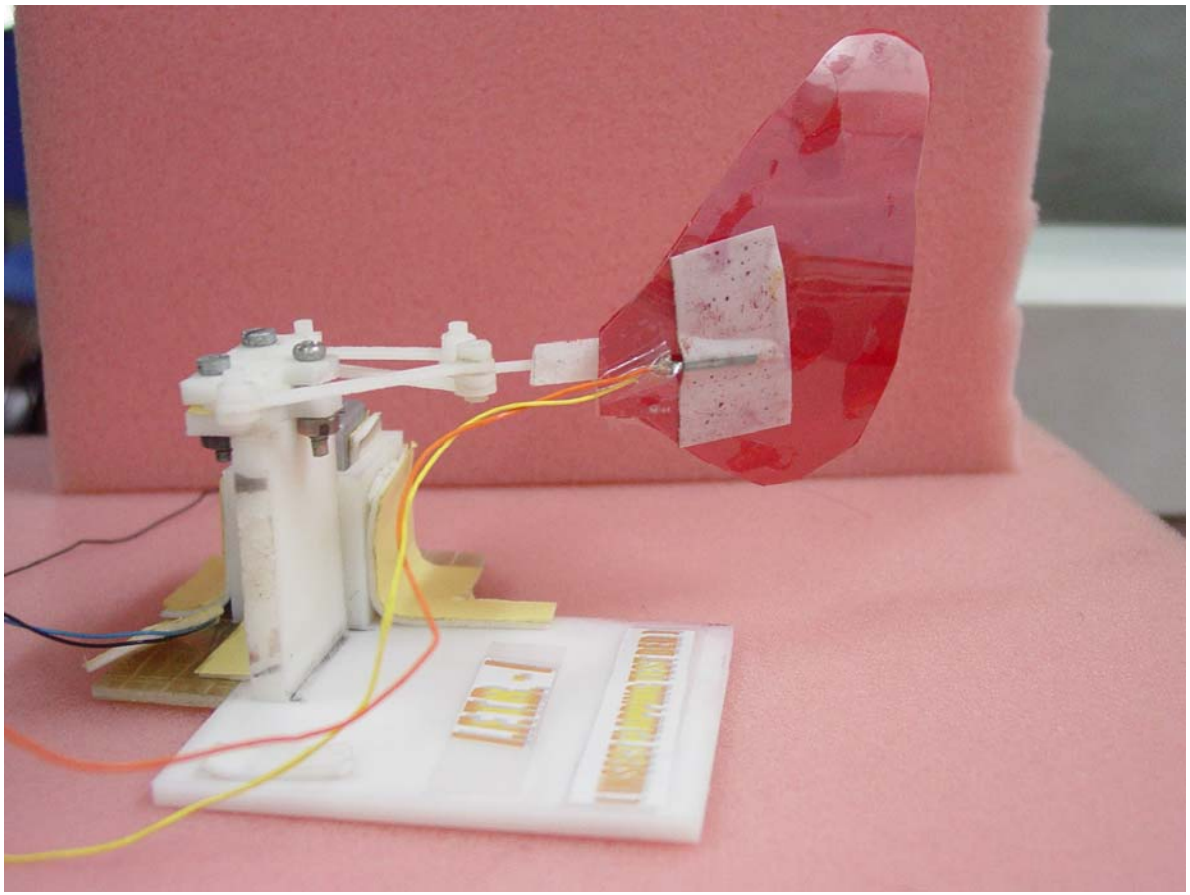
Temperature Contours around a heated cylinder



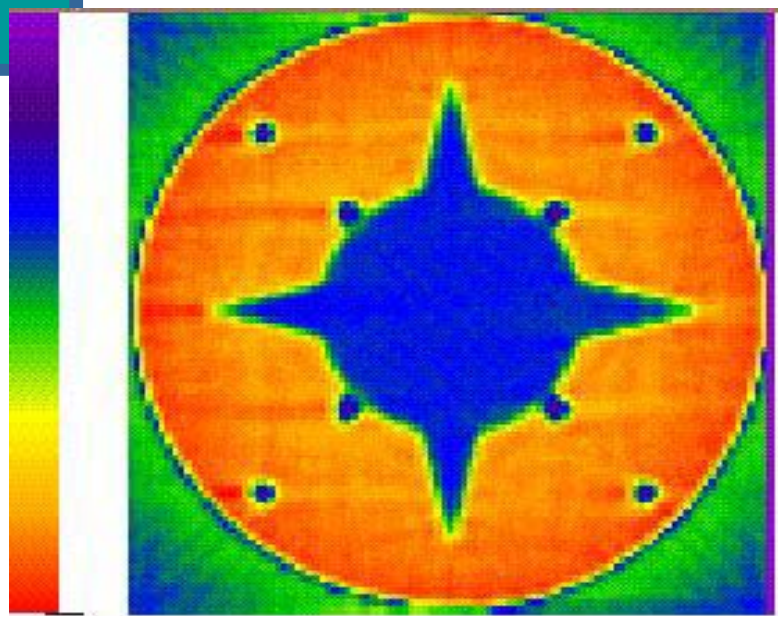
Tele-Operated Finger Robot

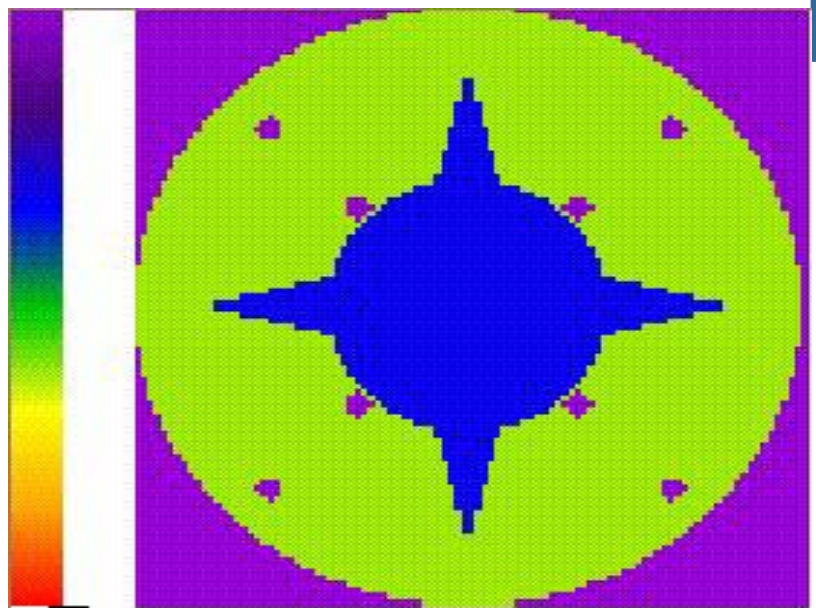


Micro-flight Test-Bed



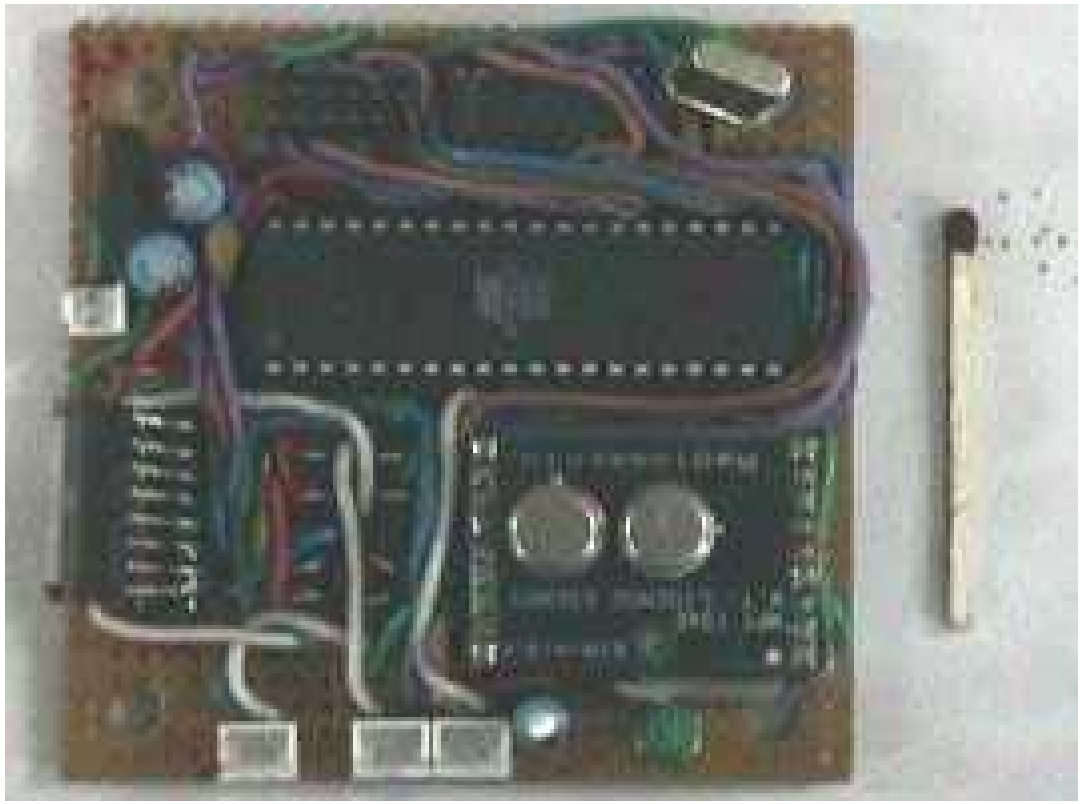
Reconstruction of a Propellant Cross-section





Fused Deposition Modeling

Soccer playing micro robots



Injection Molding Machine

Electrochemical Spark Machining

Programs

Strong programs have been developed in

- Computational Mechanics
- Computational Fluid Dynamics
- Composite Materials
- Computer Aided Design
- Laser Instrumentation
- Robotics

Science-based curriculum

Programs

Rapidly Growing in the Areas of

- Micro Electro Mechanical Systems
- Compliant Mechanisms
- Smart & Functionally Graded Materials
- Bio-Diesel & Alternative Fuels
- Fuel Cells
- Modelling & Development of Nano Materials

NET Programme

Nuclear Engineering and Technology Programme (NET) is an interdisciplinary area where only masters and doctorate degrees are awarded. The student intake is from various branches of engineering (typically, ME, EE, and ChE) and sciences (typically, Physics).

For more Details visit site: *NET Programme*

NET Programme

The faculty associated with teaching in NET is with the departments of mechanical and electrical engineering. The compulsory course package includes mathematical methods, reactor physics, nuclear physics, reactor thermal-hydraulics and reactor kinetics and controls. Visiting faculty from the Department of Atomic Energy often contributes to the teaching of some of these courses.

The research areas of the faculty are Chanoxity, Tomographic Imaging, Semi-conductors reactor dynamics and reactor safety analysis. A 10 mCi Cs137 gamma-ray source and a 5 Ci Pu-Be neutron source are available for various experimental studies. A teaching level gamma-ray CT scanner has also been developed in-house. Collaborative research projects are on with other departments within the institute (e.g., ME, EE, ChE) as well as other groups from outside (e.g., BARC, IPR, CAT, DRDL, IIT/C).

For more Details visit site: *NET Programme*

Message from the Head

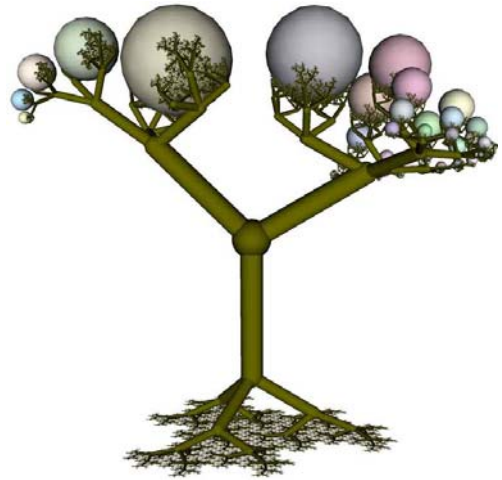
Dr. N.S. Vyas
Professor and Head
of the Department

The Department of Mechanical Engineering has played a prominent role in the Institute, by setting standards in teaching, and creating new interdisciplinary programs in Industrial Engineering, Design and Nuclear Technology.

The last decade has see an intensification of meaningful research and publications. The Department has integrated developments in electronics, computers and lasers in the teaching and research programs, thus maintaining an edge in all its activities. Recent developments in information technology, on one hand, and materials, on the other, have profoundly impacted the Department.

The Department will focus on developing cutting-edge technologies of inter-disciplinary nature on multiple scales. To this end, it will broaden its self-definition and be a continuing source of ideas to the industry.

Index



Faculty

Agarwal Avinash

Banerjee B. N.

Basu Sumit

Bhattacharya B.

Bhattacharya S.

Biswas G.

Choudhury S. K.

Dasgupta B

Das, Malay

Deb K.

Dhande S. G.

Dixit P. M.

Dutta A.

Eswaran V.

Ghosh A.

Ghoshdastidar P. S.

Gupta Anurag

Hatwal H.

Jain V. K.

Kalra M. S.

Kar K. K.

Khandekar S.

Kishore N. N.

Kumar Prashant

Mahesh Sivasambu

Munshi P.

Muralidhar K.

Panigrahi P. K.

Pundir B. P.

Ramkumar J.

Reddy N. V.

Saha A. K.

Sarkar S.

Saxena A.

Sengupta A

Sharma I

Vyas N. S.

Venkitanarayanan P.

Wahi, P

Dr. Avinash Kumar Agarwal

Research Areas

- State IC Engines
- List Combustion & Emissions
- State Alternative Fuel & Oil Tribology

Contact: akag@iitk.ac.in

Ph: 259-7982 (O), 259-8682 (R)

Dr. Barun Banerjee

Research Areas

- Design
- Mechanics
- Tribology

Contact: bnb@iitk.ac.in

Ph: 259-7081 (O), 259-8301 (R)

Dr. Sumit Basu

Research Areas

- Fracture Mechanics
- Micro Mechanics
- Multi-Scale Modelling

Contact: sbasu@iitk.ac.in

Ph: 259-7506 (O), 259-8511 (R)

Dr. Bishakh Bhattacharya

Research Areas

- Smart Structure, Intelligent Product Design
- Control-Structure Interaction
- Flexible Body Dynamics

Contact: bishakh@iitk.ac.in

Ph: 259-7824 (O), 259-8304 (R)

Dr. Shantanu Bhattacharya

Research Areas

- Micro-system design and fabrication
- Bio micro electro mechanical systems
- Nanotechnology
- Lab on chip

Contact: bhattacs@iitk.ac.in

Ph: 259-6056 (O), 259-8514 (R)

Dr. Gautam Biswas

Research Areas

- CFD
- Heat Transfer
- Turbulence

Contact: gtm@iitk.ac.in

Ph: 259-7656 (O), 259-8564 (R)

Dr. S K Choudhury

Research Areas

- Metal Cutting
- Machine Tools
- Manufacturing Automation

Contact: choudhry@iitk.ac.in

Ph: 259-7270 (O), 259-8406 (R)

Dr. Bhaskar Dasgupta

Research Areas

- Robotics
- Computer Aided Design
- Scientific Computing

Contact: dasgupta@iitk.ac.in

Ph: 259-7095 (O), 259-8706 (R)

Dr. Malay K Das

Research Areas

- Solid Oxide Fuel Cells
- Combined Radiative-Convective Ignition
- Dimensional Modeling

Contact: mkdas@iitk.ac.in
Ph: 259-7359 (O), 9434440845

Dr. K Deb

Research Areas

- Genetic Algorithm
- Optimal Design
- Machine Learning

Contact: deb@iitk.ac.in
Ph: 259-7205 (O), 259-8310 (R)

Dr. S G Dhande

Research Areas

- Computer Aided Design
- Rapid Prototyping
- Product Design

Contact: sgd@iitk.ac.in
Ph: 259-7170 (O), 259-8570 (R)

Dr. P M Dixit

Research Areas

- Metal Forming
- Impact Contact Problems
- FEM

Contact: pmd@iitk.ac.in
Ph: 259-7094 (O), 259-8784 (R)

Dr. Ashish Dutta

Research Areas

- Robotics
- MEMS & Control Systems
- Computer Vision

Contact: adutta@iitk.ac.in
Ph: 259-7562 (O), 259-8710 (R)

Dr. V Eswaran

Research Areas

- CFD
- Heat Transfer
- Turbulence

Contact: eswar@iitk.ac.in
Ph: 259-7429 (O), 259-8562 (R)

Dr. A Ghosh

Research Areas

- Manufacturing
- Dynamics & Robotics
- Metal Cutting

Contact: amitabha@iitk.ac.in
Ph: 259-7010 (O), 259-8510 (R)

Dr. P S Ghoshdastidar

Research Areas

- Computational Heat Transfer
- Boiling
- Two-phase Flow

Contact: psg@iitk.ac.in
Ph: 259-7019 (O), 259-8543 (R)

Dr. Anurag Gupta

Research Areas

- Dynamics of Defects in Solids
- Plasticity
- Waves in Solids
- Mechanics of Thin Films

Contact: ag@iitk.ac.in
Ph: 259-7503 (O)

Dr. H Hatwal

Research Areas

- Dynamics
- Control
- Robotics

Contact: hhatwal@iitk.ac.in
Ph: 259-7098 (O), 259-8384 (R)

Dr. V K Jain

Research Areas

- Unconventional Machining
- Computer Aided Manufacturing
- Machining of Advanced Materials

Contact: vkjain@iitk.ac.in
Ph: 259-7916 (O), 259-8646 (R)

Dr. M S Kalra

Research Areas

- Non-linear Dynamics and Control
- Kinetic Simulation of Fusion Plasmas
- Boundary Element Techniques

Contact: msk@iitk.ac.in
Ph: 259-7527 (O), 259-8269 (R)

Dr. Kamal K Kar

Research Areas

- Carbon Nanotube
- Nanomaterials
- Functionally Graded Composites

Contact: kamalkk@iitk.ac.in
Ph: 259-7687 (O), 259-8703 (R)

Dr. Sameer Khandekar

Research Areas

- Electronics Thermal Management
- Fuel Cell & Pulsating Heat Pipes
- Dropwise Condensation

Contact: samkhan@iitk.ac.in
Ph: 259-7038 (O), 259-8762 (R)

Dr. N N Kishore

Research Areas

- FEM
- Dynamic Fracture
- Wave Propagation & Ultrasonic NDT

Contact: nnk@iitk.ac.in
Ph: 259-7049 (O), 259-8793 (R)

Dr. A K Mallik

Research Areas

- Kinematics
- Design of Mechanisms
- Vibrations

Contact: akmallik@iitk.ac.in
Ph: 259-7098 (O), 259-8770 (R)

Dr. P Munshi

Research Areas

- Tomography
- NDT Imaging
- Nuclear Thermal Safety

Contact: pmunshi@iitk.ac.in
Ph: 259-7243 (O), 259-8573 (R)

Dr. K Muralidhar

Research Areas

- Laser instrumentation,
- Hierarchical porous Media
- Cryogenics

Contact: kmurli@iitk.ac.in
Ph: 259-7182 (O), 259-8421 (R)

Dr. P K Panigrahi

Research Areas

- MEMS & Laser Based Instrumentation
- Flow Control
- PIV

Contact: panig@iitk.ac.in
Ph: 259-7686 (O), 259-8307 (R)

Dr. P B Pundir

Research Areas

- IC Engines
- Combustion and Emission Control
- Alternate Fuels

Contact: pundir@iitk.ac.in
Ph: 259-7684 (O), 259-8451 (R)

Dr. J Ramkumar

Research Areas

- Futuristic Manufacturing
- Composite Materials
- Tribology

Contact: jrkumar@iitk.ac.in
Ph: 259-7546 (O), 259-8661 (R)

Dr. N V Reddy

Research Areas

- Metal Forming
- CAD / CAM
- Rapid Prototyping & Rapid Tooling

Contact: nvr@iitk.ac.in
Ph: 259-7362 (O), 259-8273 (R)

Dr. Arun K Saha

Research Areas

- Gas hydrates
- Vortex dynamics (Flow Physics)
- Industrial CFD and Turbulence IC Engines

Contact: aksaha@iitk.ac.in
Ph: 259-7686 (O), 259-8553 (R)

Dr. Subrata Sarkar

Research Areas

- CFD
- Turbomachinery
- Turbulence and Heat Transfer

Contact: subra@iitk.ac.in
Ph: 259-7942 (O), 259-8562 (R)

Dr. Anupam Saxena

Research Areas

- Finite Element Analysis
- Design of Compliant mechanisms and MEMS
- Structural (topology) optimization, CAD and Robotics

Contact: anupams@iitk.ac.in
Ph: 259-7988 (O), 259-8712 (R)

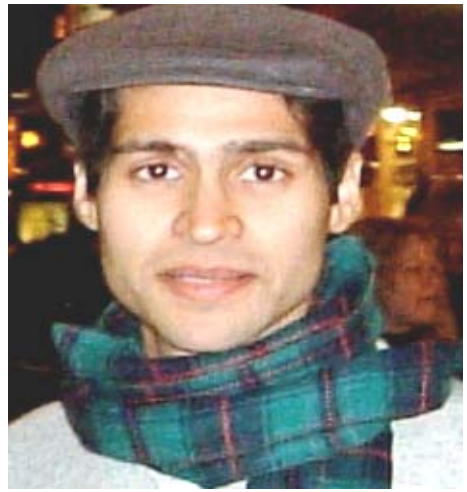
Dr. A Sengupta

Research Areas

- Nonlinear Mathematics
- Bifurcation Theory
- Neutron Transport Theory

Contact: osegu@iitk.ac.in
Ph: 259-7035 (O), 259-8705 (R)

Dr. Ishan Sharma



Research Areas

- Mechanics
- Granular Media
- Planetary Science

Contact: ishans@iitk.ac.in
Ph: 259-6152 (O)

Dr. S Mahesh

Research Areas

- Stochastic fracture mechanics
- Polycrystalline plasticity
- Material modeling

Contact: smahesh@iitk.ac.in
Ph: 259-7060 (O), 259-8163 (R)

Dr. P Venikatanarayanan

Research Areas

- Experimental solid mechanics
- Dynamic fracture mechanics
- Functionally graded composites

Contact: venkit@iitk.ac.in
Ph: 259-7528 (O), 259-8688 (R)

Dr. Nalinaksh S Vyas

Research Areas

- Vibrations, Rotor Dynamics
- Condition Monitoring
- Virtual Instrumentation

Contact: vyas@iitk.ac.in
Ph: 259-7040 (O), 259-8423 (R)

Dr. Pankaj Wahi

Research Areas

- Non Linear Dynamics
- Vibrations

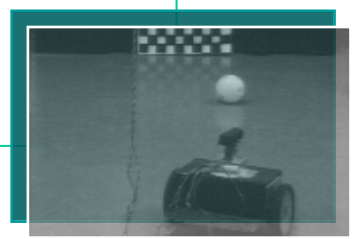
Contact: wahi@iitk.ac.in
Ph: 259-6092 (O)

Broad Streams of Research

Manufacturing Science

Fluid Mechanics & Thermal Sciences

Solid Mechanics and Design



Mechatronics

Research Laboratories

- 4-i Laboratory
- Advanced Nano Engineering Materials Laboratory.
- CAD and RP Laboratory.
- CAM & Mfg. Sc. Laboratory.
- CFD Laboratory
- Center for Mechatronics
- Computational Fluid Dynamics Laboratory
- Computational Mechanics Laboratory
- Computational Turbo-machinery
- Experimental Stress Analysis Laboratory.
- Fluid Mechanics Laboratory
- IC Engine Laboratories
- Kanpur Genetic Algorithms Laboratory (KanGAL).
- Material Testing Laboratory.
- Smart Materials & Structures Lab
- Vibration Laboratory.

4*i* Lab

Faculty:

Dr. Nalinaksh S Vyas

Research Engineer

Mr. TVK Gupta

Research Area:

The lab houses the state-of-art tools with latest capabilities in modeling and prototyping that significantly expand the domain of geometrical shapes which can be realized for any product.

Facilities:

CNC Vertical Milling Center, CNC Turning Center, Rapid Prototyping Machine, Abrasive Water Jet Cutting Machine, Laser Engraving Machine, Printed Circuit Board Making Machine

Advanced Nano Engineering

Faculty:

Dr. Kamal K Kar

Research Area:

Carbon Nanotube, Nanomaterial, Carbon-Carbon Composites, Functionally Graded Composites

Facilities:

Dynamic Mechanical & Thermal Analyzer, Environmental Zwick Universal Testing Machine, Brahender Plastic order, Computerized Goodrich Flecometer, De Mattia Fatigue Tester

CAD & RP Laboratory

Faculty:

Dr. S. G. Dhande
Dr. A. Chatterjee

Research Area:

Engineering Design & Manufacturing, Reverse Engineering, Rapid Prototyping & Rapid Tooling, CAD/CAM, Computer Graphics & Computational Geometry, Kinematics & Dynamics of Mechanisms

Facilities:

CAD software: Imageware, I-DEAS, Uni-Graphics, Pro-Engineer, CATIA
Hardware: Silicone Vacuum Casting System, Faro ARM, Stratasys FDM 1650

CAM & Manufacturing Science Laboratory

Faculty:

Dr. S. K. Choudhury, Dr. V. K. Jain,
Dr. G. K. Lal, Dr. N. V. Reddy
Dr. J. Ramkumar, Dr. A. Ghosh, S. Bhattacharya

Research Area:

Metal Cutting, Metal Forming, Manufacturing Automation, Tool Wear Monitoring, Unconventional Machining Processes, Accelerated Cutting, CAPP, CAM, Machining of Advanced Engineering Materials, Die and Mold Design, Condition Monitoring, Tribology, Micro electromechanical systems, Nanofabrication

Facilities:

Electro Chemical Spark Machining (ECSM), Electro Stream Drilling (ESD), Abrasive Jet Machining (AJM), Abrasive Flow Machining (AFM), Magnetic Abrasive Finishing (MAF), Wire Drawing Process
Tool Wear Monitoring Facility using Optical Fibers and Lasers, CNC EDM Machine (Electra EZNC), CNC Lathe (DENFORD CYCLONE),
CNC Milling Machine (DENFORD QUATROMILL), EUROBTEC, IR52c Robot, Surface Measuring Instruments, Fluorescence Microscope, Plasma exposure system

CFD Laboratory

Faculty:

Dr. Gautam Biswas, Dr. Vinayak Eswaran
Dr. Partha Ghoshdastidar,
Dr. K. Muralidhar, Dr. P.K.Panigrahi

Research Area:

Flow Past Bluff Bodies, Large-eddy Simulation, Flow and heat Transfer in Impinging Slot Jet, Mixed Convective Flow Studies, Natural Convection in Anisotropic Porous Enclosures, CFD in Food Processing, Flow Structure and Heat Transfer in Heat Exchanger Applications

Facilities:

SGI Octane/SE Dual R12000 400MHz/2MB L2 Cache, SUN ULTRA 60 with Ultra SPARC Processor, SUN ENTERPRISE 250 Computer Server, Digital Alpha 25 Workstation, Pentium IV and Pentium III based PCs with Network

Centre for Mechatronics

Faculty:

Dr. B. Dasgupta
Dr. A. K. Mallik
Dr. A. Ghosh
Dr. H. Hatwal
Dr. A. Dutta
Dr. B. Bhattacharya

Research Area:

Robotics, Machine Dynamics, Optimization, Scientific Computing, Bio-robotics, Intelligent control systems, Biomechanisms and Sensors

Facilities:

Soccer Playing Micro-Robots, Tele Operated Mobile Robots, Hyper Redundant Tele-Manipulators

Computational Mechanics Laboratory

Faculty:

Dr. Sumit Basu

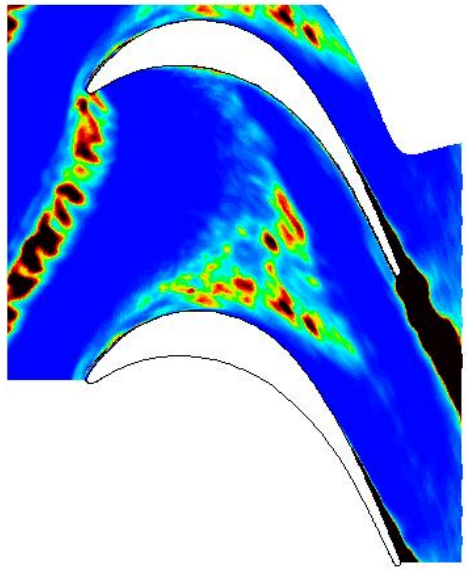
Research Area:

Multiscale modelling of materials Mechanics of thin films Thermo-mechanics of deformation and fracture in glassy polymers. Dynamic fracture mechanics Computational techniques for the simulation of contact and impact. Finite element techniques for large deformation Elastoplasticity.

Facilities:

Advanced FEM software like ABAQUS, ANSYS,
High-end Workstation based on Itanium Processor

Computational Turbo-Machinery Laboratory



Faculty:

Dr. Subrata Sarkar

Research Area:

Computational Fluid Dynamics applied to Turbomachinery: Flow analysis through blade passages, Film cooling of turbine blades, Wake-induced unsteady flows, LES for complex transitional and turbulent flows, DNS and flow instability, Development of efficient flow solvers, Turbulence modelling of compressible flows

Facilities:

Computerized table top demonstration model for Francis Impulse Turbine (Pelton Wheel), Centrifugal Pump Axial fan unit, Hydraulic Coupling, Gas Turbine Model, Centrifugal compressor, Kaplan Turbine, Several Educational Models related to turbo machinery

Experimental Stress Analysis Laboratory

Faculty:

Dr. Bishakh Bhattacharya
Dr. N. N. Kishore
Dr. P. Venkitanarayanan
Dr. Prashant Kumar
Dr. Sumit Basu

Research Area:

Composites, FEM, NDT, Dynamic Fracture, High-strain rate Deformation, Photoelasticity, Molecular Modelling, Coupled Field Analysis

Facilities:

Prepreg Machine, Laser-based Ultrasonic Device, Advanced FEM software like ABAQUS, ANSYS, FEMLAB, Split Hopkinson Bar

Fluid Mechanics Laboratory

Faculty:

Dr. A. K. Saha. , Dr. K. Muralidhar
Dr. P.K.Panigrahi, Dr. P. Munshi
Dr. Gautam Biswas, Dr. Vinayak Eswaran

Research Area:

Particle image Velocimetry: Comparisons of computational results for YAG and silicon in Czochralski process, Study of Czochralski process, Visualization of Natural convection in a Czochralski crucible using Liquid Crystal thermography (LCT) technique , Optical Techniques: Interferometry, Schlieren, and Shadowgraph, Applications of Rib Turbulators , Smoke Flow Visualization , Flow visualisation behind a cylinder

Facilities:

Turbulence Research Facility , Optical Instrumentation Facility , Computational Modelling Facility , Low Speed Wind Tunnel Lab

IC Engine Laboratory

Faculty:

Dr. A. Agarwal

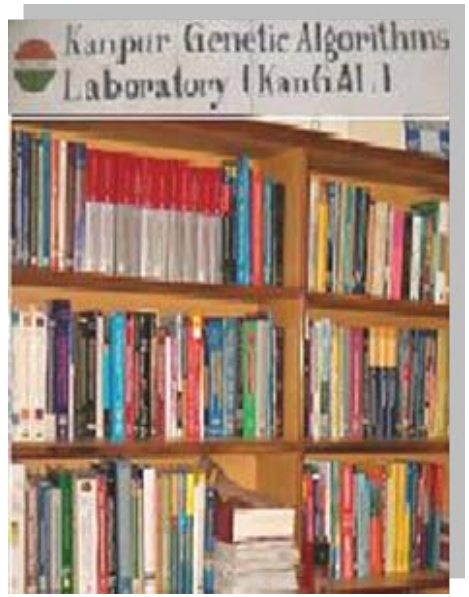
Research Area:

IC Engines, Combustion and Emissions, Biodiesel Development and Characterisation, Lubricating Oil Tribology, Laser Diagonistic Techniques and Microsensor Development for IC Engines

Facilities:

CFR Engine, M&M Direct & Indirect Injection (DI) Engine, Maruti Zen MPFI Engine, BAJAJ Tempo Engine, Stationary Agriculture Engines, Portable Gen Set engine, Fiat Engine, EDDY Current Dynamometers, Laminar Flow Equipment for volumetric flow rate measurement, High Precision Shaft Encoder, Kinematic Viscometer, Dead Weight Pressure Gauge Tester, Bomb Calorimeter, Horiba Raw exhaust emission analyzer for HC,CO,CO2 , O2 & NOX measurement, Indica V2 engine test bench, Mahindra DI engine test cell for gaseous fuel applications, Multi-channel data logger AVL Indimeter

Kanpur Genetic Algorithm Laboratory



Faculty:

Dr. K. Deb

Research Area:

Multi-Objective Evolutionary Algorithms, Non-dominated Sorting Genetic Algorithm, Innovization: Innovation Through Optimization, Real-Parameter Genetic Algorithms, Constrained Nonlinear Optimization

Facilities:

- Parallel Computing Clusters
  - A 36 node PC based cluster: The cluster uses gigabit cards and wires to connect the nodes.
  - An 18 node PC based cluster: Each node is a dual processor P3 1.0 GHz machine
- Desktops and Workstations

Material Testing Laboratory

Faculty:

Dr. Kamal K Kar
Dr. Bishakh Bhattacharya
Dr. N. N. Kishore
Dr. P. Venkitanarayanan
Dr. P. Kumar

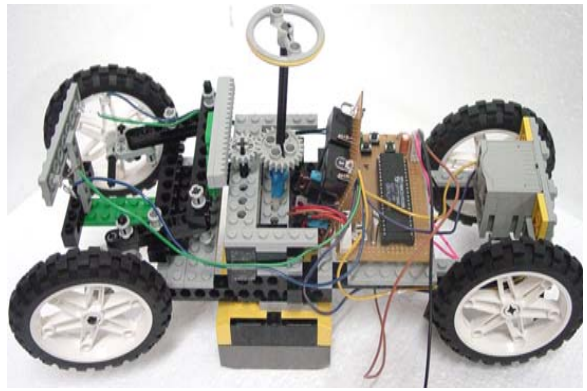
Research Area:

Advanced Polymeric Composites, Functionally Graded Composites, Smart Particulate Composites, Nano-composites

Facilities:

Vacuum Bagging Apparatus, Zeta Potentiometer, Two roll mixing mill, 50 ton Hydraulic Press, Environmental Ageing Oven, Microhardness Testing

Smart Materials structures & Systems Laboratory



Faculty:

Dr. Bishakh Bhattacharya
Dr. Ashish Dutta

Research Area:

Active Vibration Control, Non-contact Energy Dissipation, Energy Harvesting & Energy Scavenging Sensors & Actuators, Terfenol-D, PZT and EAP based Smart Composites, Shape Memory Alloy Based Actuators, Robotic Grasping Mechanism, Space Antenna Shape Control

Facilities:

Advanced software like ABAQUS, ANSYS, FEMLAB, ATILA, Labview, Smart Material Test Set-up, D33 meter, Multi-sensor array, Digital Storage Oscilloscope, Digital FFT Analyser, DSpace system, Motion Control and PXI System

Vibration Laboratory

Faculty:

Dr. N. S. Vyas
Dr. A. K. Mallik
Dr. H. Hatwal

Research Area:

Conditioning monitoring, Kinematics, Design of Mechanisms, Dynamics of Machinery, Non linear Vibration, Robotics

Facilities:

Proximity Transducer System, Portable Vibration meter with filter unit, Friction drive Rotator, Random noise generator, Vibration Meter, Conditioning Amplifier, Universal Avometer, Function generator, Waveform processor, Digital strain indicator

Research Process in the PhD Program

Course Work: A Ph.D student is required to undertake a minimum of four courses. He may, upon consultation with his thesis supervisor, take more courses as needed to carry out his thesis work.

Comprehensive Exam: Within 6 months of completion of course work the student is require to clear written exam (2 minors and 1 major) and an oral viva in 3 subjects which he chooses in consultation with his supervisor.

State of Art Seminar: The student is required to present his research problem along with the necessary literature survey with in 6 months after his oral viva date.

Open Seminar: After finishing his thesis work the student has to present it before the department. Only after his thesis work has been cleared from the department he is allowed to submit it.

Defense: After review from the referees the student is allowed to give defense of his work.

For more Information on Admission Please Visit the Web Page of Dean of Academic Affairs

Career Prospects for PG Students

The PG programme at IIT Kanpur is one of the most intense and demanding in the country. A graduating PG student is not only theoretically sound but is also very well versed with latest computational and experimental skills. Thus students are readily absorbed in giant multinational firms like GE, GM and Indian firms like TATA Steel to name a few. A lot of students are absorbed in other premier research organizations like ISRO, DRDO and academic institutions like IITs, BITS Pilani, RECs. Every year a majority of students take up doctoral/postdoctoral studies in prestigious foreign universities and Labs in US, GERMANY, UK, CANADA.

What Lies Beyond…

- Virtual Laboratories
- Generative Manufacturing
- Explore small scales (MEMS, Nanotechnology)
- Explore large scales (Clouds, Atmosphere, Natural reservoirs)

Contact Information

Head of the Department

Dr. N.S. Vyas

Phone: 91-512-259 7040

Fax: 91-512-259 7408

Email: head_me@iitk.ac.in, vyas@iitk.ac.in

Mechanical Office

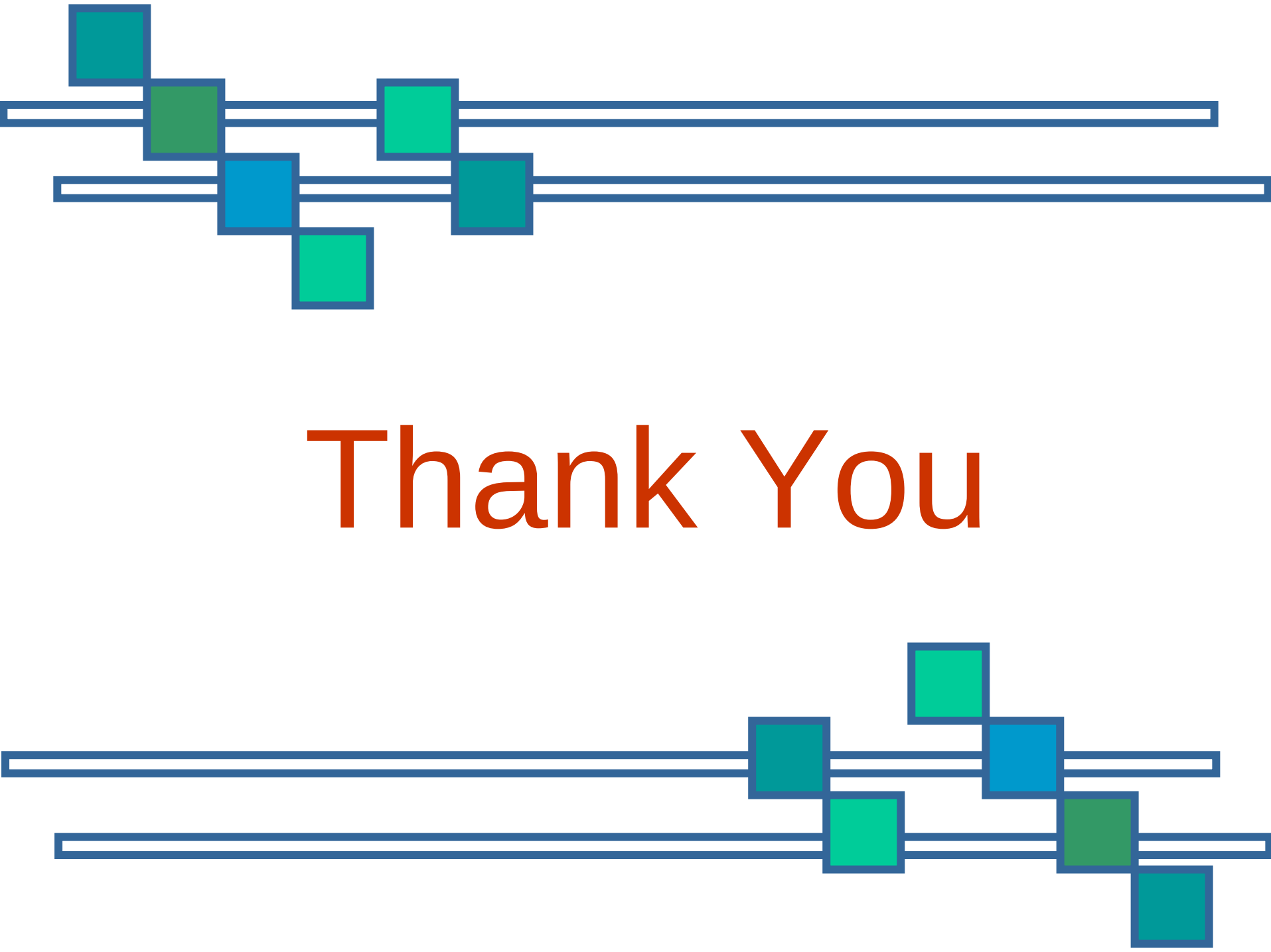
Department of Mechanical Engineering
Indian Institute of Technology Kanpur
Kanpur 208016.
Uttar Pradesh, India.
Phone: +91 512 2597627
Fax: +91 512 2597408

Department Post Graduate Committee (DPGC)

Convener: **Dr. V. Eswaran**

Ph: 259-7429; 259-8562

email: eswar@iitk.ac.in


Thank You