IIT DELHI
2018-19

RECRUITMENT BROCHURE

DEPARTMENT OF APPLIED MECHANICS
“The Applied Mechanics department offers a unique combination of courses in its M Tech. programme. The students get a firm grounding in the fundamentals related to the areas of Fluid Mechanics, Materials Science and Solid Mechanics along with rigorous training in the use of current analytical, experimental and computational tools. This equips them to analyse complex engineering systems and undertake their design with proficiency.”

Dr. Srinivas V. Veeravalli
Head, Applied Mechanics

“The students graduating from our department are among the brightest in the nation and are well trained in various cutting-edge technology domains. They have achieved top positions in various leading organizations in the past and are always highly sought-after by leading organizations worldwide owing to the level of skills they acquire at IIT Delhi. I welcome the recruiters for the campus placement and I am confident that you will find exceptionally talented engineers for your organization.”

Dr. Sawan S. Sinha
Professor-in-charge, T&P, Applied Mechanics
ABOUT US

Department of Applied Mechanics was established in 1964 with a perspective of being a specialized branch involving teaching, research and consultancy works. It creates an ambience in which new ideas flourish for the welfare and development of society. Various national and international collaborative projects are being undertaken by the faculty of the department. Students of the department are capable to deal with wide range of technical and on field challenges through the experience that they gain from the industrially oriented projects.

The admission procedure for the M. Tech. program comprises of an initial short-listing based on a student’s GATE (Graduate Aptitude Test in Engineering) score followed by a final written test conducted by the department itself. This two-stage selection process ensures that only the very best of the students make it to the department.

SOLID MECHANICS
- Composites
- Failure Analysis
- Dynamics and Vibrations
- Metal Forming Analysis
- Finite Element Analysis
- Large Deformation Modelling & Analysis
- Smart Materials
- Bio-mechanics

FLUID MECHANICS
- Fluid Structures Interaction
- Turbulence Modelling
- CFD
- Thermal Analysis of flows
- Hydrodynamic Instability
- Industrial Aerodynamics
- Multi phase Fluid Flows
- Pipeline Engineering
- Flow diagnostics

MATERIAL SCIENCE
- Fracture Mechanics
- Metal Foams
- Atomic Force Microscopy
- Nano Indentation
- Molecular Dynamics Simulation of Nano-Composites
- Microstructure Manipulation
- Tribology Studies

PRODUCT DESIGN
- Project Feasibility
- Product Design
- Design Methodology
- Design Optimization
- Finite Element Analysis
- CAD & CAM
- Product Reliability
- Failure Analysis and Prevention

The M. Tech. program offered by the department is ‘ENGINEERING ANALYSIS AND DESIGN (AMA)’ having three streams, namely - DESIGN ENGINEERING, ENGINEERING MECHANICS and MATERIAL ENGINEERING.
The stream of Design Engineering has been consistently attracting bright students, and is one of the most popular M.Tech programs of the Institute among the students as well as industries. Product design is becoming increasingly interdisciplinary, often requiring the knowledge of electronics, instrumentation etc. in addition to solid mechanics, fluid mechanics and material science. Students take a wide range of specialized elective courses which enable them to successfully design and develop products.

**KEY COURSES OF THE STREAM**

- Product Design & Feasibility
- Advanced Solid Mechanics
- Fracture Mechanics
- Properties & Selection of Materials
- Finite Element Methods
- Product Reliability & Maintenance
- Continuum Mechanics
- Advanced Fluid Mechanics
- Advanced Dynamics
- Design Optimization
- CAD
- CFD

**SOME OF THE ON-GOING PROJECTS BY M. TECH. STUDENTS**

**A. Simulations based on commercial FEA, CFD and other packages**

- Design for low and high velocity impact of composites.
- Reliability assessment of light weight composite armours.
- CFD analysis of aircraft carriers.
- Design optimization of groundnut harvester.

**B. Simulations with self-written codes & verification by FEA packages**

- Design of an airship platform for search & rescue mission.
- Optimization of processing parameters for porous shape memory fibre networks.
- Fatigue creep interaction analysis through continuum damage mechanics.
- Shock response spectrum analysis and design of frames.

**C. Experimental & Fabrication related projects**

- Design of polymeric seal, testing setup for DIC measurements.
- Design of experiments and fixtures for testing composite material of bullet proof jacket.
- Design, fabrication of impact head cushion.
- Design, fabrication and calibration of soft robotic actuator.

**DESIGN ORIENTED COURSES**

<table>
<thead>
<tr>
<th>Design Optimization</th>
<th>Product Design &amp; Feasibility</th>
<th>Finite Element Methods</th>
<th>Product Reliability</th>
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</thead>
<tbody>
<tr>
<td>This course focuses on optimizing an objective function involving multiple variables and constraints.</td>
<td>This course aims at developing a product which has utility in society or industrial application.</td>
<td>This course focuses on formulation of finite element model.</td>
<td>The main objectives of this course are</td>
</tr>
<tr>
<td>It focuses on formulating objective functions of product that have been developed as part of product design course.</td>
<td>Need analysis and targeting a problem keeping in focus the end user.</td>
<td>Writing own finite element code in MATLAB.</td>
<td>To understand the probabilistic and reliability analysis techniques.</td>
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<tr>
<td>Optimizing objective functions for various constraints.</td>
<td>Developing alternate designs in CAD modelling softwares such as CATIA, SOLIDWORKS, CREO.</td>
<td>Automated pre- &amp; post-processing.</td>
<td>To understand the importance of quantifying the risk involved in any practical problem.</td>
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<td></td>
<td>Fabrication &amp; Testing.</td>
<td>Comparing FEM results with analytical results.</td>
<td>To facilitate the decision of most sensitive design parameter which considerably affects the risk involved in the problem.</td>
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</tbody>
</table>
Engineering Mechanics is a broad area of Applied Mechanics, which focuses on research, analysis and development of computational and experimental tools for solving problems in areas of solid mechanics and fluid mechanics. The major areas of expertise involve Linear and Nonlinear elasticity, Composite materials, Impact mechanics, Computational mechanics, Turbulence modelling, to name a few. Students of the department are equipped to deal with a wide range of technical and on-field challenges through the experience that they gain from the research as well as our industrially-oriented projects. The research and project works are intended at giving thrust to the development in the areas of:

<table>
<thead>
<tr>
<th>Solid Mechanics</th>
<th>Fluid Mechanics</th>
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<tbody>
<tr>
<td>Dynamics and Vibration</td>
<td>Turbulence Modelling</td>
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<tr>
<td>Nonlinear Finite Element Analysis</td>
<td>Computational Fluid Dynamics</td>
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<tr>
<td>Light Weight Structural Materials</td>
<td>Pipeline Engineering</td>
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<tr>
<td>Failure Analysis</td>
<td>Fluid Structure Interaction (FSI)</td>
</tr>
</tbody>
</table>

**IMPORTANT COURSES**

- Finite Element Analysis
- Theory of Plates and Shells
- Advanced Dynamics
- Advanced Solid Mechanics
- Computational Fluid Dynamics
- Advanced Fluid Dynamics
- Turbulence & its Modelling
- Turbulent Shear Flows
- Fracture Mechanics
- Mechanics of Composites
- Physics of Turbulence
- Continuum Mechanics

**SOME OF THE ON-GOING PROJECTS BY M. TECH. STUDENTS**

A. **Computational Modelling and Analysis using in-house code**

Involves numerical and analytical modelling and analysis of structural solid and fluid problems. These projects include coding using languages such as MATLAB, FORTRAN and MATHEMATICA.

Some of the ongoing projects are:
- Thermal shock response of Functionally Graded Material plates using XFEM
- Elasto-dynamics of finitely deforming shells under aerodynamic load.
- Constitutive modelling of Nano rods and energy harvesting materials.
- Linear Stability of liquid flow based on energy budget method.

B. **Simulation using commercial FEA and CFD packages**

Computational packages such as ABAQUS, ANSYS, COMSOL, GAMBIT, OpenFOAM, Fluent, CFX etc. are used for simulation of specialized problems. Major ongoing works include:
- Study of ballistic impact on steel (Johnson cook’s model)
- Heat transfer enhancement in Microchannels.
- Turbulence Modelling of flow over an airship using CFD.
- Fatigue creep interaction analysis through continuum damage mechanics

C. **Experimental Analysis**

Involves design of experimental set up and investigation of different problems related to solids and fluids.

The ongoing projects involving experimental analysis are:
- Investigation of dynamic material response using SHPB.
- Development of fluid dynamics model for flow analysis of cardiovascular defect.
- FE modelling and experiments on impact of 3D composites.
Material Engineering is an intrinsic part of Applied Mechanics. It focuses on research, analysis and development of computational and experimental tools for solving problems in industrial application. The major areas of expertise involve Linear and Nonlinear elasticity, Composite materials, fracture mechanics, 3D modelling of crystals, tribological behaviour analysis, Modern engineering materials like shape memory alloys and high entropy alloys, etc. Students of this stream are equipped to deal with a wide range of modern testing techniques and on-field challenges through the experience that they gain from the research as well as our industrially-oriented projects.

### Material Science

- Nano Materials
- Metal Foams
- Crystal Plasticity
- Alloy Design
- Smart Materials
- Composites

### Scanning Electron Microscope (SEM) image of Nano scratch

### IMPORTANT COURSES

- Fracture mechanics
- Modern engineering materials
- Failure analysis and its prevention
- Micro and Nano scale mechanical behaviour of engineering materials
- Property and selection of engineering materials
- Continuum Mechanics
- Microstructural characterization of materials
- Phase transformation
- Design methods

### SOME OF THE ON-GOING PROJECTS BY M. TECH. STUDENTS

- Mechanical and tribological behaviour of high entropy alloys using Atomic Force Microscopy (AFM).
- Design and characterization of Auxetic materials.
- 3D printing of models of crystals, their defects and anisotropic property.
- Wear analysis of Magnesium composite using Nano Indentation and AFM.
- Corrosion behaviour of Magnesium alloy
- Effect of microstructural parameters on transformation behaviour in Titanium alloys.
- Nano scale tribology of lubricant additives for automobile application.
- Experimental analysis of deformation mechanism of Cobalt.
- Design and characterization of Shape Memory Alloy (SMA) based porous structures.

### MATERIAL CHARACTERIZATION LAB ARE EQUIPED WITH

- Atomic force microscopy (AFM)
- Nano indentation
- Scanning electron microscope (SEM)
- Transmission electron microscope (TEM)
- Micro hardness tester
- X-ray Diffraction (XRD)
- Induction welding equipment
- Creep testing equipment
- Universal testing machine (UTM)
RESEARCH FACILITIES

- Computational Fluid Dynamics Laboratory
- Fluid Mechanics Laboratory
- Strength of Materials Laboratory
- Material Characterization Laboratory
- Gas Dynamics Laboratory
- Stress Analysis Laboratory
- Experimental Method and Analysis Laboratory
- Impact Mechanics Laboratory
- Computational Laboratory
- Departmental Workshop

SOFTWARE

- ANSYS
- ABAQUS
- Fluent
- GAMBIT
- CFX
- OpenFOAM
- COMSOL
- Nessus
- MATLAB
- fe-safe
- FORTRAN
- CES Material Selection
RECRUITMENT PROCEDURE

Student-in-charge or placement officer, Training and Placement Cell shall provide the company a Job Notification Form (JNF)

JNF requires details of the job offer – role offered, pay package, place of posting, eligible departments

Once the filled-in-JNF with all the required details is received, companies are assigned username/password to access their online account at http://tnp.iitd.ac.in

Companies are also assigned space on the server on which they may upload any presentation, videos, data or other information they want the students to see

The JNF has to be frozen on the T&P website by the company by a fixed date.

Students shall be able to view all the details, and the eligible candidates may apply
After the application deadline for the students, the resumes are visible to the company. The company submits shortlist on its online account before a deadline.

Short-listed students get notified.

The placement office allots the dates for the campus interviews.

After the completion of the selection procedure on campus, company is required to announce the final list of the students on the same day itself.

If a student is selected, the job is registered against him/her and he/she would not be allowed to appear for more interviews as per the institute’s policy.

**RESUME VERIFICATION**

All claims made by students in resumes submitted for campus placement are duly verified by the Placement Office. The verification standards are uniform throughout the Institute.
STUDENT PLACEMENT COORDINATOR

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