

## MECHANICAL ENGINEERING

Ahead in top gear



Mechanical engineering is among the most diverse and versatile of the engineering disciplines and is the innovative application of science and technology to the design, production and operation of mechanical devices, machinery and systems. The stream of Mechanical engineering touches virtually every aspect of modern life, from mobile phones and biomedical devices, to aircrafts and power plants and involves designing things, especially complex items like racing yachts, robots, sawmills and aircrafts, industrial machinery and processes, etc. It also involves the efficient design and use of energy and energy conversion systems such as heating, refrigeration and air-conditioning systems, turbomachines, etc.

If you are intrigued by how things work, fascinated by fully automated robots and high speed automobiles, mega-machines that can dig mountains or spaceships that crosses boundaries of planets to the tiniest machines like nanobots then mechanical engineering is the profession for you. In addition to physics and mathematics, it encompasses key elements of aerospace, electrical, civil, chemical and even materials science and bio-engineering. Since mechanical engineering is involved in almost every design imaginable, one finds mechanical engineers associated with almost any field of interest.

| PROGRAMMES OFFERED                     | INTAKE     |
|--|------------|
| <b>BTech in Mechanical Engineering</b> | <b>135</b> |
| <b>MTech in CAD/CAM</b>                | <b>18</b>  |
| <b>MTech in Thermal Engineering</b>    | <b>18</b>  |
| <b>PhD in Mechanical Engineering</b>   | ✓          |

### ABOUT THE BTECH PROGRAMME IN MECHANICAL ENGINEERING

The four years of curriculum aims to develop a broad set of skills and apply that knowledge into varied fields of mechanical engineering. The programme is designed to develop practical, analytical, creative and design skills in the students through interactive classroom sessions; hands on experiences during workshops; design and creative skills in laboratories and through major projects.

## PROGRAMME SPECIFIC OUTCOMES

- To apply the concepts of material science and engineering, computer aided engineering, thermal engineering and manufacturing technologies for design, development, analysis and maintenance of mechanical systems or processes.
- To work as a professional or as an entrepreneur by applying mechanical engineering principles and management practices.



## STRENGTH OF THE DEPARTMENT

- The Department is a blend of highly motivated and experienced faculty members possessing research qualifications and/or industrial exposure. The faculty members regularly update their knowledge and skills through various training and learning modes and keep themselves abreast with the state-of-the-art knowledge and emerging trends in science and technology.
- The Department has well established laboratories in areas such as Dynamics of Machines, Fluid Mechanics and Fluid Power, Heat Transfer, Alternate Energy Sources, Refrigeration and Air Conditioning, I.C. Engines and Automobile Engineering, Materials Technology, Metrology and Instrumentation, Production Technology, Manufacturing Processes, Workshop, CAD/CAM Centre, Robotics, etc. along with a unique Thermal Insulation Testing Laboratory. The Computer Centre includes networked terminals with software such as Creo, ANSYS, AutoCAD, Design Studio, Hyperworks, HTRI, Solidworks, Robocell, SciLab, CATIA, Automation Studio, MathCAD, Originlab, DynaForm, EES, TecPlot, etc.

## STUDENT ACTIVITIES

The student activities are vibrant in the Department and conducted through a dedicated club of Mechanical Engineering Students' Association (MESA) run by the student fraternity which organises national level competitions, symposiums and extension activities. The student teams of Society of Automotive Engineers (SAE India Nirma University Chapter), regularly participate in the All Terrain Vehicles (ATV) competitions and have won prizes in various categories of the national level SAE BAJA event. The robotic team has won the national level robotics competition ROBOCON for a record eight times and has represented India at the international robotic event. The ASHRAE Western India Student Chapter at Nirma University is very active and conducts various activities for the promotion of refrigeration and air conditioning engineering.

## CAREERS FOR MECHANICAL ENGINEERS

The Mechanical engineering graduates are sought by employers in almost all sectors of the engineering industry. These include industries involved with aerospace, automotive, chemicals, construction, defense, consumer goods, marine, materials and metals, oil and gas, pharmaceuticals, power generation, rail, utilities, automation etc. among several others.

The students have found placement in industries such as: Larsen & Toubro Ltd, Elecon Engineering Co. Ltd, Tata Consultancy Services, ABB Limited, Linde India, Mahindra & Mahindra Ltd, Jyoti CNC Automation Pvt Ltd, Siemens Ltd, Ingersoll Rand (I) Ltd, KHS Machinery, INOX, Zeppelin and many more.

# Curriculum

## FIRST YEAR

### Semester-1/2

- Linear Algebra/ Calculus and Differential Equations
- Chemistry
- Physics
- Environment Studies
- Computer Programming
- Engineering Graphics
- Elements of Electrical and Electronics Engineering
- English Communication
- Mechanical Workshop
- Electrical Workshop
- Introduction to Engineering

#### Supplementary Courses

- Design Thinking
- ICT Tools and Cyber Security
- Law and Engineering
- Yog and Meditation

## SECOND YEAR

### Semester-3

- Material Science and Engineering
- Manufacturing Processes-I
- Thermodynamics
- Theory of Machines
- Mechanics of Solids
- Principles of Management
- Introduction to Computer Aided Drafting

#### Supplementary Courses

- Community Services

### Semester-4

- Metrology & Quality Control
- Fluid Mechanics & Hydraulic Machines
- Manufacturing Processes-II
- Dynamics of Machines
- Mathematics for Mechanical Engineering
- Principles of Economics
- Introduction to Machine Design

## THIRD YEAR

### Semester-5

- Machine Design – I
- Automation and Control
- Heat and Mass Transfer
- Electric Machine
- Dept Elective I
- Open Elective I
- University Elective

### Semester-6

- Energy System I
- Machine Design II
- Department Elective II
- Department Elective III
- Open Elective II
- Humanities Elective

## FOURTH YEAR

### Semester-7

- Manufacturing Technology and Management
- Energy System II
- Department Elective IV
- Department Elective V
- Open Elective III
- Open Elective IV
- Minor Project
- Summer Internship

### Semester-8

- Major Project

## DEPARTMENT ELECTIVE COURSES

Advanced Thermodynamics, Basics of Flight and Aerodynamics, Stress Analysis, Process Planning & Cost Estimation, Composite Materials, Foundry Technology, Experimental Methods, Robotic Engineering, Industrial Design, Mechanism Analysis and Design, Maintenance Engineering and Asset Management, Gas Dynamics, Micro Electro Mechanical Systems, Machine Tool Design, Fatigue Creep Fracture, Advanced Metal Forming, Advanced Welding Technology, Quality And Reliability Engineering, Surface Engineering, Fundamentals of Computational Fluid Dynamics, Heat Exchangers, Refrigeration Engineering, Automobile Engineering, Condition Monitoring of Mechanical Equipment, Basics of Machine Learning, Mobile Robotics, Tribology, Failure Analysis, CNC Technology And Programming, Hydraulics and Pneumatics, Work Study, Air-Conditioning Engineering, Theory and Design of Steam and Gas Turbines, Advanced machining Methods, Computer Integrated manufacturing, Operations Research, Supply Chain Management, Rapid Prototyping, Tool Engineering, Advanced Mechanical Vibrations, Optimization Techniques, Finite Element Analysis, Mechatronics.