

# Bachelor of Engineering in Mechanical Engineering (4 Years, 240 ECTS)

A design-centered mechanical engineering program covering mechanics, thermofluids, materials, and manufacturing, with extensive CAD/CAE practice and hands-on prototyping.

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## Program Overview

- **Award:** B.Eng. in Mechanical Engineering
- **Duration:** 8 Semesters (4 academic years)
- **Total Credits:** 240 ECTS
- **Delivery:** Lectures (L), Tutorials (T), Laboratories (P), Design Studio (S), Internship (I)
- **Workload:** 1 ECTS  $\approx$  25–30 hours
- **Program Pillars:** Engineering Mechanics • Thermodynamics • Fluid Mechanics • Materials & Manufacturing • Machine Design • Dynamics & Control • Mechatronics • CAD/CAE & Simulation • Sustainable Engineering • Safety & Ethics
- **Signature Experiences:** design studios every year, prototype validation in labs, and an industry internship.

## Graduate Learning Outcomes

Graduates will be able to:

- 1 **Engineering Analysis.** Apply mechanics and thermofluid principles to analyze mechanical systems.
- 2 **Design.** Create mechanical components and systems using structured design processes and standards.
- 3 **Manufacturing.** Select materials and manufacturing methods considering cost, tolerance, and sustainability.
- 4 **Modeling & Simulation.** Use CAD/FEA/CFD tools to predict performance and validate designs.
- 5 **Experimentation.** Plan tests, measure performance, and interpret results with uncertainty analysis.
- 6 **Systems Thinking.** Integrate mechanical, electrical, and control elements in mechatronic systems.

- 7 **Professional Practice.** Work safely, communicate effectively, and follow ethical engineering conduct.
- 8 **Real-World Impact.** Apply mechanical engineering to energy, mobility, health devices, and climate solutions.

# Curriculum Structure

Structured across 8 semesters (30 ECTS each). Most courses are 6 ECTS unless otherwise noted.

## Year 1

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| <b>Semester 1 (30 ECTS)</b> | <ul style="list-style-type: none"><li>• Calculus I - 6 ECTS</li><li>• Engineering Physics I (Mechanics) - 6 ECTS</li><li>• Introduction to Engineering Design - 6 ECTS</li><li>• Engineering Graphics &amp; CAD - 6 ECTS</li><li>• Engineering Communication - 6 ECTS</li></ul> |
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| <b>Semester 2 (30 ECTS)</b> | <ul style="list-style-type: none"><li>• Calculus II - 6 ECTS</li><li>• Engineering Physics II (E&amp;M;) - 6 ECTS</li><li>• Statics - 6 ECTS</li><li>• Materials Science (Intro) - 6 ECTS</li><li>• Engineering Ethics &amp; Safety - 6 ECTS</li></ul> |
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## Year 2

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| <b>Semester 3 (30 ECTS)</b> | <ul style="list-style-type: none"><li>• Dynamics - 6 ECTS</li><li>• Mechanics of Materials - 6 ECTS</li><li>• Thermodynamics I - 6 ECTS</li><li>• Manufacturing Processes - 6 ECTS</li><li>• Technical Elective I - 6 ECTS</li></ul> |
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| <b>Semester 4 (30 ECTS)</b> | <ul style="list-style-type: none"><li>• Fluid Mechanics I - 6 ECTS</li><li>• Machine Elements &amp; Design - 6 ECTS</li><li>• Thermodynamics II - 6 ECTS</li><li>• Mechanical Measurements Laboratory - 6 ECTS</li><li>• Technical Elective II - 6 ECTS</li></ul> |
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## Year 3

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| <b>Semester 5 (30 ECTS)</b> | <ul style="list-style-type: none"><li>• Heat Transfer - 6 ECTS</li><li>• Control Systems (Intro) - 6 ECTS</li><li>• CAD/CAE (FEA) - 6 ECTS</li><li>• Mechatronics Laboratory - 6 ECTS</li><li>• Technical Elective III - 6 ECTS</li></ul> |
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- Semester 6 (30 ECTS)**
- Fluid Mechanics II (Turbomachinery) - 6 ECTS
  - Mechanical Design Project Studio - 6 ECTS
  - CAD/CAE (CFD) - 6 ECTS
  - Technical Elective IV - 6 ECTS
  - Industry Internship - 6 ECTS
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## Year 4

<b>Semester 7 (30 ECTS)</b>	<ul style="list-style-type: none"><li>• Sustainable Energy Systems - 6 ECTS</li><li>• Advanced Dynamics &amp; Vibrations - 6 ECTS</li><li>• Advanced Manufacturing (Additive) - 6 ECTS</li><li>• Technical Elective V - 6 ECTS</li><li>• Capstone Design I (Concept &amp; Analysis) - 6 ECTS</li></ul>
<b>Semester 8 (30 ECTS)</b>	<ul style="list-style-type: none"><li>• Capstone Design II (Prototype &amp; Validation) - 12 ECTS</li><li>• Engineering Project Management - 6 ECTS</li><li>• Entrepreneurship for Engineers - 6 ECTS</li><li>• Advanced Seminar &amp; Presentation - 6 ECTS</li></ul>

## Technical Elective Tracks

Choose at least 5 electives; focus on one track for specialization.

### Track A — Energy & Thermal Systems

- HVAC Design
- Combustion & Emissions
- Renewable Thermal Systems
- Battery Thermal Management

### Track B — Robotics & Mechatronics

- Robot Kinematics
- Embedded Control
- Sensors & Actuators
- Autonomous Systems

### Track C — Design & Manufacturing

- Design for Manufacturing
- Advanced CAD

- Composite Manufacturing
- Quality Engineering

### **Track D — Biomechanics**

- Biomechanics
- Medical Device Design
- Human Factors
- Rehabilitation Engineering

# Laboratories & Facilities

## Prototyping Makerspace

3D printing, CNC machining, laser cutting, and rapid prototyping support for design studios.

## Thermofluids Lab

Wind tunnel, flow loops, heat exchanger rigs, and instrumentation for thermofluid experiments.

## Materials & Manufacturing Lab

Metallography, hardness testing, and manufacturing process demonstrators.

## Simulation Suite

Industry-standard CAD/FEA/CFD software with workstation access for advanced analysis.

# Capstone Design Examples

- **Electric Go-Kart Powertrain**  
Design and validate drivetrain, cooling, and lightweight structure for performance and safety.
- **High-Efficiency Heat Exchanger**  
Optimize geometry with CFD and validate with lab measurements.
- **Assistive Gripper Device**  
Prototype a safe, ergonomic gripper with sensor feedback and control.
- **Low-Cost Wind Turbine Blade**  
Design a blade for local manufacturing and test structural and aerodynamic performance.