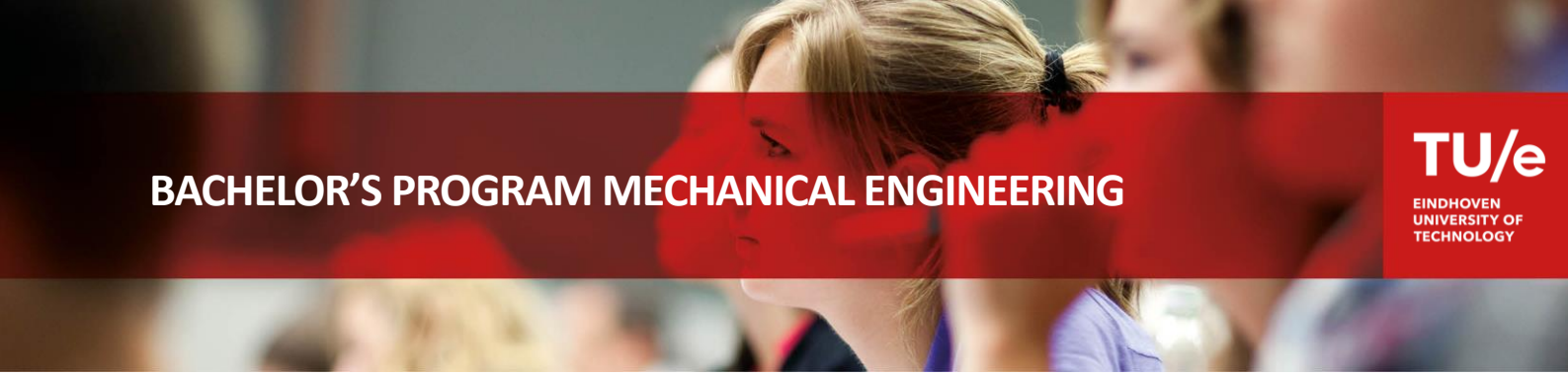

# BACHELOR'S PROGRAM MECHANICAL ENGINEERING

TU/e EINDHOVEN UNIVERSITY OF TECHNOLOGY

## Year 1

| Quartile 1 (September until November) | |
|---|---|
| **Course** | **Description** |
| Calculus | You will learn basic mathematical techniques such as differential equations and integral calculus to describe phenomena and solve problems. This course will help you to solve mathematical problems in the other courses |
| Mechanics | You will learn to analyze truss and beam structures and determine forces, bending moments, strains and stresses. |
| Introduction to Mechanical Engineering and CBL truss structure | This course consists of a theoretical part and a practical part (group project). In the theoretical part, different main topics of ME such as dynamics and materials are introduced. The practical part introduces Challenge-Based Learning, where the theory from Mechanics is put into practice to create a truss structure. |

| Quartile 2 (November until February) | |
|---|---|
| **Course** | **Description** |
| Principles of design and programming | This course consists of a design part and a programming part. In the design part you will learn the basics of mechanical design and in the programing part the basics of modern programming.<br>You will learn Python and Mathlab. |
| Dynamics | You will learn to model and analyze the dynamic behavior of simple mechanical systems, such as a mass-spring-damper system. Some topics from mathematics are introduced to support the modelling, such as linear algebra, complex numbers and linear second order differential equations. |
| CBL Design of a Launching mechanism | In this Challenge-Based Learning project, you will design a construction that launches a projectile as far as possible. You will make a 3D-model (CAD-model) and produce the construction prototype using 3D-printing. |

# BACHELOR'S PROGRAM MECHANICAL ENGINEERING

TU/e EINDHOVEN UNIVERSITY OF TECHNOLOGY

| Quartile 3 (February until April) | |
|---|---|
| **Course** | **Description** |
| Structure and properties of materials | You will learn to understand the micro-structure of materials, the start and evolution of these structures and the relation of the micro-structure with the macro-scale mechanical properties of the materials. |
| Introduction Transport Phenomena | You will learn to create and solve models for simple flow and heat problems. These problems consist of hydrostatics, hydrodynamics, diffusion processes, and heat and mass transport. Mathematical topics such as polar coordinates and ordinary differential equations are taught to support the modelling. |
| CBL Multiped Robot | In this Challenge-Based Learning project you will create and test a robot with multiple legs that can walk on different surfaces. You will use provided components for robot control and power and can utilize 3D printing and laser cutting for parts. After building the robot, you will assess its performance on various terrains, analyze the results and compare them with your own model. |

| Quartile 4 (April until July) | |
|---|---|
| **Course** | **Description** |
| Signals and Systems | You will learn about signals and systems in both time and frequency domains. Through practical projects you will have a better understanding of real-world applications. |
| ITEC Ethics | You will learn to navigate ethical challenges in areas like sustainability, privacy, and health. This includes understanding core ethical concepts and applying them to technology development and design. |
| CBL energy storage and transport | In this Challenge-Based Learning project, you will develop an inventive solution for storing and transporting sustainable energy. You'll create a mathematical-physical model, validate it through experiments, and analyze the idea's feasibility using this model. |

# BACHELOR'S PROGRAM MECHANICAL ENGINEERING

## Year 2

| Q1 (September until November) | |
|---|---|
| **Course** | **Description** |
| Thermodynamics | In thermodynamics, you will learn how heat and mechanical energy can be converted from one to the other. The course focuses on analyzing the operation, efficiency, and performance of energy systems such as power plants, turbines, engines, and compressors. The course also delves into renewable energy sources |
| Statistics & Probability | This course introduces the basic principles of statistics and probability. You will obtain insight into the use and application of relevant statistical techniques and understand the influences of errors and uncertainties in (physical) experiments. |
| Free elective | During your studies, you will be given a lot of elective space. 25% of your study time is spent on courses of your own choice, within or outside your department. This allows you to develop your own profile as an engineer. |

| Q2 (November until February) | |
|---|---|
| **Course** | **Description** |
| Dynamics & Control of Mechanical Systems | In this course, you will begin learning how to model and control the dynamic behavior of mechanical systems such as precision technology and automotive systems. You'll start by understanding how to derive equations of motion for Multi-Degree-Of-Freedom (MDOF) mechanical systems and analyze their vibration. |
| CBL Sustainable Fuels: Plan A or Plan B? | In this Challenge-Based Learning project, you will explore the functioning of a compact internal combustion engine (generator set). Through practical experiments using a small setup, you'll understand its operation. You will create a dynamic model using Matlab, validating it with the experimental data. You will also determine the pros and cons of using different types of sustainable flues in this engine. |
| Free elective | During your studies, you will be given a lot of elective space. 25% of your study time is spent on courses of your own choice, within or outside your department. This allows you to develop your own profile as an engineer. |

| Q3 (February until April) | |
|---|---|
| **Course** | **Description** |
| Solid Mechanics | Solid Mechanics controls the design, service, life time and manufacturing of virtually any product. You will learn the principles that link service conditions, loads, material selection, and resulting 3D mechanical behavior. You will learn how to solve design problems using mathematical and numerical (computer) methods. |
| CBL Control of a flexible robot system | In this Challenge-Based Learning project, you will be learning to control a robot arm. The object is to program the robot system to perform a specific task as quickly, efficiently and quietly as possible. |

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|---|---|
| Free elective | During your studies, you will be given a lot of elective space. 25% of your study time is spent on courses of your own choice, within or outside your department. This allows you to develop your own profile as an engineer. |

**Q4 (April until July)**

| Course | Description |
|---|---|
| Heat and Flow | Heat and flow plays an important role in many applications in engineering. Examples are the processes in the engine of a car, a heat exchanger in a power plant, the drag coefficient of a car or a thermal collector on the roof of a house. In this course, the first principles of heat and fluid flow will be treated with which these phenomena/systems can be described and computed. |
| Multidisciplinary CBL | In this Challenge-Based Learning project, you and your group, consisting of members from different bachelor programs, will design, create and evaluate a product to promote or support sustainable behavior. |
| Free elective | During your studies, you will be given a lot of elective space. 25% of your study time is spent on courses of your own choice, within or outside your department. This allows you to develop your own profile as an engineer. |

# BACHELOR'S PROGRAM MECHANICAL ENGINEERING

## Year 3

| Q1 (September until November) | |
|---|---|
| **Course** | **Description** |
| Computational Mechanics | Computer simulations used in ME solve numerically differential equations. This course treats the theory and algorithms used in translating such equations into computer codes. You will build your own simple simulation code in Matlab, which will also help you use more advanced commercial software for fluid dynamics and solid mechanics later on. |
| ITEC Advanced | You will continue to learn to navigate ethical challenges in areas like sustainability, privacy, and health and applying them to technology development and design. |
| Free elective | During your studies, you will be given a lot of elective space. 25% of your study time is spent on courses of your own choice, within or outside your department. This allows you to develop your own profile as an engineer. |

| Q2 (November until February) | |
|---|---|
| **Course** | **Description** |
| Micromanufacturing | In this course the concepts and challenges of Micromanufacturing are introduced. |
| Free elective | During your studies, you will be given a lot of elective space. 25% of your study time is spent on courses of your own choice, within or outside your department. This allows you to develop your own profile as an engineer. The elective space includes 45 credits. |
| Free elective | During your studies, you will be given a lot of elective space. 25% of your study time is spent on courses of your own choice, within or outside your department. This allows you to develop your own profile as an engineer. |

| Q3 (February until April) | |
|---|---|
| **Course** | **Description** |
| BEP | The Bachelor End Project (BEP) is the last project in the Mechanical Engineering program. During this semester-long project, you will engage in ongoing research within the department, applying the knowledge and skills you've acquired throughout your Bachelor studies. |
| Free elective | During your studies, you will be given a lot of elective space. 25% of your study time is spent on courses of your own choice, within or outside your department. This allows you to develop your own profile as an engineer. The elective space includes 45 credits. |
| Free elective | During your studies, you will be given a lot of elective space. 25% of your study time is spent on courses of your own choice, within or outside your department. This allows you to develop your own profile as an engineer. The elective space includes 45 credits. |

# BACHELOR'S PROGRAM MECHANICAL ENGINEERING

| Q4 (April until July) | |
|---|---|
| **Course** | **Description** |
| BEP | The Bachelor End Project (BEP) is the last project in the Mechanical Engineering program. During this semester-long project, you will engage in ongoing research within the department, applying the knowledge and skills you've acquired throughout your Bachelor studies. |
| Free elective | During your studies, you will be given a lot of elective space. 25% of your study time is spent on courses of your own choice, within or outside your department. This allows you to develop your own profile as an engineer. The elective space includes 45 credits. |
| Free elective | During your studies, you will be given a lot of elective space. 25% of your study time is spent on courses of your own choice, within or outside your department. This allows you to develop your own profile as an engineer. The elective space includes 45 credits. |

Core courses

Free electives