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VIA University College

Dato: August 2021

Curriculum

Programme section

Bachelor of Engineering in Mechanical Engineering

Applicable to students enrolled in August 2021 and later.

Contents

Introduction

In accordance with the Executive Order on Bachelor of Engineering, the purpose of Bachelor of Engineering is to qualify the students to carry out the following professional functions nationally and internationally:

- Transpose technical research results as well as scientific and technical knowledge to practical use in development tasks and in solving technical problems
- Critically acquire new knowledge within relevant engineering areas
- Independently solve common engineering tasks
- Plan, implement and manage technical and technological facilities, including being able to involve social, economic, environmental and occupational health consequences in the solution of technical problems
- Participate in collaborative and managerial functions and contexts at a qualified level with people who have different educational, linguistic and cultural backgrounds

In addition, the education must qualify students to participate in further studies.

VIA Engineering programmes work on the basis of a common graduate profile. The graduate profile is a common profile for all VIA Engineers. The graduate profile is to be combined with the identity of the specific engineering programme.

At VIA Engineering, we are practice-oriented, project-oriented and world-focused. This is put into practice in the form of qualified new graduates obtained through targeted teaching, relevant research and development, as well as collaboration and ongoing dialogue with the business community. The programmes must qualify graduates to handle practical and development-oriented business functions.

Programmes in English as well as admission of international students are hallmarks of our engineering programmes. This profile creates a unique opportunity to educate students who can act in a Danish context in an increasingly global market. Our lecturers have vast and solid practical experience and know how to anchor theory in practice through lab work, company visits and projects for and in collaboration with companies.

1 Identity of the programme

The Mechanical Engineering Programme at VIA has the additional goal of qualifying its graduates to handle business functions, where the main aim is product development and the construction of machines and plants, with the possibility of specialisation in 1) Intelligent Mechanics, 2) Polymers or 3) Sustainable Energy. It is central that in relation to the above, graduates gain a deep understanding of scientific issues, experimental skills and familiarity with IT tools. At the same time, the goal is for graduates to develop skills to be able to function as project managers within the field of machinery, both nationally and internationally.

The goals of the programme are achieved primarily by:

- Project work being an essential aspect of the teaching, where the academic elements of the programme are integrated via problem solving into a whole, with a focus on application-oriented and practical engineering work. In project work, emphasis is also placed on the students developing academic, professional, methodological, communicative and personal skills.
- Collaborating with research environments and businesses in connection with the implementation of the teaching.
- Offering an international study environment, where parts of the study can be completed abroad, and where several courses are held in English for Danish and foreign students alike.
- Actively using the student's engineering internship to bring about the exchange of knowledge and experiences between VIA and the profession.
- Achieving application- and practice-oriented skills primarily by utilising VIA's facilities within laboratories, manufacturing workshops and libraries, as well as completing internships and practical workshops.
- Priority being given to interdisciplinary focus areas within Digitalisation, Sustainability and Innovation and Entrepreneurship in the programme across the various semesters.

2 Graduate profile for VIA Engineers

Purpose
The newly graduated VIA engineer works problem-oriented, project- and team-based and contributes to advising, developing, inventing and quality-assuring products and solutions. The VIA engineer creates innovative, digital, sustainable and workable solutions to and for current and future societal and engineering challenges worldwide.

Skills
VIA Engineering educate holistic-thinking engineers who, through societal insight and personal development, can exploit the full potential of technology. Therefore, the skills of the VIA engineer range from highly specialised engineering skills to personal skills and the skills of the outside world.

Professional engineering skills

- Masters and applies – with critical reflection – highly specialised engineering knowledge.
- Works challenge-driven, innovative and problem-oriented when developing engineering results.
- Integrates engineering and scientific knowledge, skills and methods in solving engineering challenges.
- Designs, plans, simulates, manages, implements and evaluates engineering solutions and products using digital and technological tools.
- Implements and operates solutions that match engineering needs within the industry.

Organisational skills

- Organises and manages projects and processes based on both risk assessment and market and business understanding.

- Collaborates inter-professionally with a global view and respect for the organisation, culture and methods of businesses and stakeholders.
- Involves knowledge of sustainability and circular economy in the development and implementation of new solutions.

Personal skills
- Works consistently with a curious and innovative mindset and seeks out, critically acquires and brings new knowledge into play throughout life.
- Communicates effectively and collaborates professionally with colleagues and people of different educational and cultural backgrounds.

3 Teaching and working methods

The engineering programme's priority focus areas within Digitalisation, Sustainability and Innovation and Entrepreneurship are integrated into relevant courses, so that together they constitute learning streams for all three areas.

Active and practice-oriented learning is supported by:
- Dialogue-based teaching with a high degree of active participation from students.
- Lectures in subjects where there is a large proportion of knowledge transfer. Lectures are usually combined with practice sessions with a student tutor.
- Project work and problem-oriented learning (PBL) are an essential part of the teaching, as the academic elements of the education programme are integrated into application-oriented engineering projects with emphasis on methodological problem solving.
- Projects being carried out in groups within the programme and in an interdisciplinary collaboration with other engineering programmes.
- Collaborating with research environments and businesses in connection with the implementation of the teaching.
- Offering an international study environment, where parts of the study can be completed abroad and where several courses are held in English for Danish and foreign students alike.
- The student's engineering internship being actively used to bring about the exchange of knowledge and experiences between VIA and the profession.

Application- and practice-oriented skills are primarily achieved by utilising VIA's facilities within laboratories, manufacturing workshops and library.

The reading of the study material requires English on level B in order to complete the programme.

Teaching can be physical, online or located at another campus.

4 Structure and content

The programme is organised as an ordinary full-time higher education programme.
The structure and progression including exams is stated in the overview on the next page.

The official duration of the degree program is 3½ years, divided into 7 semesters of 30 ECTS, corresponding to 210 ECTS points in total.

The scope of each course or project is documented in the form of ECTS points (European Credit Transfer System). 1 ECTS point corresponds to a workload of 27.5 hours for a student, an academic year of 60 ECTS thus corresponds to 1,650 hours of work for the student.

New students are admitted in August every year.

The study includes:

- Compulsory courses and projects
- Elective courses
- Internship
- Bachelor project
- Practical Workshops

A semester consists of 3-4 courses, which are delimited courses. A course's scope can range from 5 to 10 ECTS points, and a project's scope from 10 to 20 ECTS points.

The purpose, scope, learning objectives and exams of courses are described in this curriculum. For a detailed and complete description of the individual courses, please refer to the course descriptions in force at any given time, which are available on VIA's website and on VIAs Studynet.

There are 5 practical workshops associated with the mechanical engineering programme.

The programme is structured as illustrated below:

Programme: 1st-7th semester

The programme is structured as illustrated below:

Semester & Theme	Course 5 ECTS	Course 5 ECTS	Course 5 ECTS	Course/Project 5 ECTS	Project 5 ECTS	Project 5 ECTS
7th semester *Bachelor Project and Specialisation*	**AUC1** Automatic regulation and control techniques	**Electives** With focus on specialisation	**Electives** With focus on specialisation	**Bachelor Project**		
6th semester *Automation and Specialisation*	**DSM1** Dynamic systems and measuring techniques	**AUT1** Automatic machine systems	**Elective** With focus on specialisation	**BPR1** Preparation for bachelor project	**SEP 6** Semester Project 6: Innovation with focus on specialisation	
5th semester *Internship*	**INP1** Engineering internship					
4th semester *Energy And Business*	**FEM1** Finite element analysis 1	**TER1** Thermo and fluid dynamics	**DIG2** Digitalization 2: Industry 4.0	**ECE1** Economy for engineers	**SEP 4** Semester Project 4: Sustainable energy in a business perspective	
3rd semester *Machine Elements and Electronics*	**MEM1** Machine elements and design	**ELE1** Electronics	**DYN2** Dynamics 2	**MAT2** Mathematics 2	**SEP 3** Semester Project 3: Company project and machine design	
2nd semester *Machine Design and Materials*	**MEK2** Mechanics 2	**MMT2** Materials and technologies 2	**DYN1** Dynamics 1	**MAT1** Mathematics 1	**SEP 2** Semester Project 2: Advanced product design, mechanics, production and materials	
1st semester *Machine Design and Digitalization*	**MEK1** Mechanics 1	**MMT1** Materials and technologies 1	**DIG1** Digitalization 1: CAD and micro controllers	**TDE1** Technical design	**SEP 1** Semester Project 1: Design from need to product	

In case of ECTS credits transfer or in the transition to a new study curriculum, special arrangements can occur.

Practical Workshops: 1-5

The practical workshops structured as illustrated below:

Semester Theme	Course
4th semester *Energy and Polymers*	**PWS5** Workshop 5: Practical work shop in energy systems, polymer production methods and robotics
3rd semester *Electrics, hydraulics and pneumatics*	**PWS4** Workshop 4: Practical work shop in electrical direct current- and alternating current systems, electro motors, hydraulic- and pneumatic circuits and components
3rd semester *CNC-Machining*	**PWS3** Workshop 3: Practical work shop in CNC machining, CAD/CAM and assembly techniques
2nd semester *Welding, cutting and bending*	**PWS2** Workshop 2: Practical work shop in flame cutting, TIG/MAG- welding, plasma cutting bending and assembly techniques
1st semester *Turning and Milling*	**PWS1** Workshop 1: Practical work shop in machining, measuring techniques and safety

Some practical workshops are located outside campus.

5 Compulsory elements of the education programme, 1st-4th semester

All courses and projects in the first four semesters are compulsory.

The 1st-4th semesters all contain a semester project amounting to 10 ECTS and included will be learning inputs in the form of videos, online lectures, learning paths etc. amounting up to 2.5 ECTS. The amount of learning inputs can vary in the different semesters. The learning inputs are followed up by discussions initiated by the project supervisor.

The overall purpose of the semester project is to link the semester's courses together as a whole. Study technique. project management, methodology, scientific theory, research methodology and teamwork are introduced through the study in connection with the semester projects.

The 6st-7th semesters contain compulsory courses and electives which are targeted the three specialisations.

Each semester is themed, and knowledge and skills are acquired through the courses, while competencies are acquired and can be tested in the project – Problem-oriented learning.

1. Semester: Machine Design and Digitalization
2. Semester: Machine Design and Materials
3. Semester: Machine Elements and Electronics
4. Semester: Energy and Business
5. Semester: Internship
6. Semester: Automation and Specialisation
7. Semester: Bachelor Project and Specialisation

5.1 1st semester: Design from need to product

On the 1st semester the student is introduced to topics about mechanical design, materials, production methods and the technical drawing. The student will also become familiar with digitalization and understand how censors and actuators are controlled.

The purpose of the courses, ECTS and assessment:

Mechanics (MEC1) – 5 ECTS	**Assessment**
The course aims to provide the student with basic skills in statics and strength theory to be able to analyse and dimension products, machines and production equipment within the industrial field.	Individual oral examination, 20 minutes Internal censor Grading: The Danish 7-point scale Reexam: As ordinary
Materials and Technologies (MMT1) – 5 ECTS	
The main purpose of the course is to enable the student to choose relevant types of steel based on material properties and to select relevant manufacturing technologies.	Individual oral examination, 20 minutes Internal censor Grading: The Danish 7-point scale Reexam: As ordinary
Digitalization (DIG1) – 5 ECTS	
The course aims to equip students with basic digital skills in engineering. The course is divided into two tracks: - 3D CAD and digital twins - Micro controllers and automation	Individual written examination, 2 hours Internal censor Grading: The Danish 7-point scale Reexam: As ordinary
Technical Design (TDE1) – 5 ECTS	
The course aims to provide the student with knowledge and methods for outlining and illustrating machine constructions according to the applicable standardized rules.	Individual oral examination, 20 minutes Internal censor Grading: The Danish 7-point scale Reexam: As ordinary
Semester Project (SEP1) – 10 ECTS	
The purpose is to design machine components from need to product. Apply professional competencies in a problem-based context and solve engineering problems based on current semester subjects.	Group report. Oral group examination with individual evaluation. Internal censor Grading: The Danish 7-point scale Reexam: As ordinary

The learning objectives of the courses (knowledge, skills and competencies) and further information about the form and conditions of the examination are given in Appendix 1.

Scope:
30 ECTS

5.2 2nd semester: Machine Design and Materials

In the second semester, emphasis is placed on extended mechanics and product design and the student gets to expand knowledge in materials, dynamics and mathematics.

The purpose of the courses, ECTS and assessment:

Mechanics (MEC2) – 5 ECTS	**Assessment**
The aim of the course is to enable the student to analyse stresses, strains and deformations in structures with the purpose of assessing a machine construction in relation to safety against permanent deformation and fracture.	Group exam with individual evaluation Internal censor Grading: The Danish 7-point scale Reexam: As ordinary
Materials and Technologies (MMT2) – 5 ECTS	
The main purpose of the course is to enable the student to choose relevant materials among cast iron, stainless steel, titanium, aluminium or polymers, based on material properties and corrosion environment. Choose relevant manufacturing technologies in a design and development situation.	Individual oral examination, 20 minutes Internal censor Grading: The Danish 7-point scale Reexam: As ordinary
Dynamics (DYN1) – 5 ECTS	
The course aims to provide the student with basic skills in particle dynamics and forms the basis for DYN2.	Individual written examination, 4 hours External censor Grading: The Danish 7-point scale Reexam: As ordinary
Mathematics (MAT1) – 5 ECTS	
The course aims to strengthen and expand the student's basic skills in mathematics, especially in differential calculus.	Individual written examination, 4 hours External censor Grading: The Danish 7-point scale Reexam: As ordinary
Semester Project (SEP2) – 10 ECTS	
The purpose is to train basic study techniques and team-based project work in connection with making extended product design. Apply professional competencies in a problem-based context and solve engineering problems based on current and previous semesters' subjects.	Group report. Oral group examination with individual evaluation. External censor Grading: The Danish 7-point scale Reexam: As ordinary

The learning objectives of the courses (knowledge, skills and competencies) and further information about the form and conditions of the examination are given in Appendix 1.

Scope:
30 ECTS

5.3 3rd semester: Machine Elements and Electronics

In the 3rd semester, machine components which are both statically and dynamically loaded are calculated and dimensioned. Electrical systems are taught in order to select correct electric motors ant the knowledge of dynamics and mathematics is expanded.

The purpose of the courses, ECTS and assessment:

Machine Elements and Design (MEM1) – 5 ECTS	**Assessment**
To acquire methods and tools in machine elements, technical design and dynamically loaded shafts.	Group exam with individual evaluation Internal censor Grading: The Danish 7-point scale Reexam: As ordinary
Electrical Engineering (ELE1) - 5 ECTS	
The main purpose is to gain knowledge about electrical systems, electrical installations and to be able to calculate and select correct electric motors.	Individual oral examination Internal censor Grading: The Danish 7-point scale Reexam: As ordinary
Dynamics (DYN2) – 5 ECTS	
The course should enable students to apply kinematics and kinetics for describing the movement of rigid bodies, as well as introducing the description of mechanical vibrations.	Individual oral examination External censor Grading: The Danish 7-point scale Reexam: As ordinary
Mathematics (MAT2) – 5 ECTS	
The purpose of the course is to introduce students to linear algebra and basic numerical programming in MATLAB	Individual oral examination Internal censor Grading: The Danish 7-point scale Reexam: As ordinary
Semester Project (SEP3) – 10 ECTS	
The purpose is to carry out a business project with machine design and apply basic study techniques and team-based project work. Apply professional competencies in a problem-based context and solve engineering problems based on current and previous semesters' subjects.	Group report. Oral group examination with individual evaluation. External censor Grading: The Danish 7-point scale Reexam: As ordinary

The learning objectives of the courses (knowledge, skills and competencies) and further information about the form and conditions of the examination are given in Appendix 1.

Scope:
30 ECTS

5.4 4th semester: Energy and Business

The 4th semester is characterized by dealing with energy and business understanding, but also analytical calculation.

The purpose of the courses, ECTS and assessment:

Finite Element Method (FEM1) – 5 ECTS	**Assessment**
The main purpose of the course is to enable the student to solve linear static problems using the FE method and be able to recognize possibilities and limitations in using a commercial FE software.	Individual oral examination External censor Grading: The Danish 7-point scale Reexam: As ordinary
Thermo and fluid dynamics (TER1) – 5 ECTS	
The student will obtain knowledge of the basic theory within thermodynamics and be able to perform elementary thermal calculations. Incorporate energy aspect in mechanical projects and have a basic knowledge of energy specialisation.	Individual written examination External censor Grading: The Danish 7-point scale Reexam: As ordinary
Digitalization (DIG2) – 5 ECTS	
The purpose is to provide the student with basic engineering digital competencies within the industry 4.0 area. The course is co-read across the sector to raise the quality of the digital foundation.	Individual oral examination Internal censor Grading: The Danish 7-point scale Reexam: As ordinary
Economics for Engineers (ECE1) - 5 ECTS	
The main purpose of the course is to enable students to assess and present the financial consequences of a business case concerning investments in capital equipment and / or product and market development.	Individual written examination External censor Grading: The Danish 7-point scale Reexam: As ordinary
Semester Project (SEP4) – 10 ECTS	
The purpose is to use renewable energy in a business perspective. Apply professional competencies in a problem-based context and solve engineering problems based on current and previous semesters' subjects.	Group report. Oral group examination with individual evaluation. External censor Grading: The Danish 7-point scale Reexam: As ordinary

The learning objectives of the courses (knowledge, skills and competencies) and further information about the form and conditions of the examination are given in Appendix 1.

Scope:
30 ECTS

5.5 5th semester: Internship

ME-INP1

The internship comprises a semester of 30 ECTS and timewise is placed in the 5th semester of the programme. As a general rule the internship period is paid and settled in a private or public company in Denmark or abroad. Student must be on an internship for a minimum of 20 full weeks excluding holidays, etc.

The purpose of the internship is for the student to acquire insight into practical common engineering work corresponding to engineering assistant work, combined with the integrated application of the acquired concepts, methods and techniques of the discipline in the first four semesters.

The student themselves is responsible for finding an internship, which must be approved by VIA, who appoints a supervisor for the intern.

In collaboration with the company, the student prepares a plan for the internship with appertaining formulated assignments.

The basis for assessment of the internship is an ongoing report from the student to VIA, feedback from the internship company and a presentation where the supervisor can ask elaborating questions about the content of the internship.

If the engineering internship is interrupted before the end of the agreed internship period, the internship supervisor must, in consultation with the head of the education programme, assess whether the internship has been of sufficient length and content for there to be grounds for passing the internship present.

The internship is graded as passed/not passed. Internal evaluation

5.6 6th semester: Automatics and Specialization

In the 6th semester, a compulsory cross-sectoral semester project is carried out, which aims to develop and document an inter-organizational innovation project in collaboration with a company or institution. There is also the possibility of a cross-sectoral semester project, where work is done on an entrepreneurial project.

Compulsory courses in measurement technology and automatic machine systems are completed and electives are chosen with a focus on specialization.

The bachelor project begins in the 6th semester (BPR1) with choice of subject and preparation of project description.

The purpose of the courses, ECTS and assessment:

Innovation with a focus on Specialization (SEP6) – 10 ECTS	**Assessment**
To develop and document an inter-organizational innovation project.	Group report. Oral group examination with individual evaluation. External censor Grading: The Danish 7-point scale Reexam: As ordinary

Dynamic Systems and Measurement Technology (DSM1) - 5 ECTS	
The main purpose of the course is to gain knowledge about measurement systems, skills in planning and analysis and reporting of experiments.	Oral group presentation followed by an individual evaluation Internal censor Grading: The Danish 7-point scale Reexam: As ordinary
Automatic Machine Systems (AUT1) - 5 ECTS	
The course aims are to provide the student with basic skills in pneumatic and hydraulic systems and to give knowledge in product dimensioning and analysing of machines and production equipment, within the industrial field.	Individual oral examination External censor Grading: The Danish 7-point scale Reexam: As ordinary
Preparation for Bachelor Project (BPR1) - 5 ECTS	
To document the ability to analyse and explore a technical problem and set up plans and methods for solving it. To work efficiently and self-driven alone and in collaboration with others as a mechanical engineer through a project definition phase. To demonstrate the ability to apply acquired knowledge, utilize feedback from previous and current semesters and independently acquire new knowledge when relevant.	Approved / Not approved on basis of the project description Internal censor Grading: The Danish 7-point scale Reexam: As ordinary

The learning objectives of the courses (knowledge, skills and competencies) and further information about the form and conditions of the examination are given in Appendix 1.

Scope:
30 ECTS

5.7 7th semester: Bachelor Project and Specialization

In the 7th semester, a compulsory course in automatic regulation and control technique is completed, with the aim of acquiring knowledge and skills in control and regulation of mechanical automatic systems, and electives are chosen with a focus on specialization.

The bachelor project (BPR2) which has begun in the 6th semester with choice of subject and preparation of project description continues.

The purpose of the courses, ECTS and assessment:

Bachelor Project (BPR2) – 15 ECTS	**Assessment**
To document the ability to work efficiently and self-driving in collaboration with others as a mechanical engineer. To deliver expected results in a timely manner by acting proactively if obstacles arise. To demonstrate a deep understanding of scientific issues, applied techniques, experimental qualifications and IT tools. It is also a goal that the candidates develop qualifications to work as a project manager in the field of mechanics, both nationally and internationally.	Group exam with individual evaluation External censor Grading: The Danish 7-point scale Reexam: As ordinary

Automatic Control and Monitoring Technology (AUC1) - 5 ECTS	
To analyse technical automatic systems and specify automatic requirements for control as well as to select the correct control strategy and management. To provide students with a practical knowledge of on-off control.	Individual oral examination Internal censor Grading: The Danish 7-point scale Reexam: As ordinary

6 Electives

Electives must be chosen in the 6th and 7th semesters. In addition to electives that are targeted at selected specializations, a number of relevant elective courses are offered for the Mechanical Engineering program. Descriptions of the individual elective courses appear from the overview of the courses under section 7.1 and from the course descriptions in appendix 1.

It is also possible to choose one course of 5 ECTS from another education program at VIA, but not courses where the content essentially consists of material from the previous courses of study. Any course choice from other programs must be approved by a study advisor in the engineering programs, as it must be ensured that the chosen course is relevant to the program and constitute an increasing academic level.

Excluded are courses in other programs that may appear in the overview in section 7.1.

The following elective courses are offered at the Mechanical Engineering program. (Selected electives are taught in Danish - the rest in English).

The purpose of the courses, ECTS and assessment:

Robotics and Multibody Systems (RMS1) – 5 ECTS	**Assessment**
Analysis of commercial robots, design and analysis of "home-made" robots and mechanisms, simple programming of a robot, and basic knowledge of the application of machine vision in robotics.	Individual oral examination Internal censor Grading: The Danish 7-point scale Reexam: As ordinary
System Dynamics, Simulation and Control (SMC1) – 5 ECTS	
To give students knowledge about and ability to develop and analyse dynamic mechatronic models. To give the student basic knowledge about automatic controls.	Individual oral examination Internal censor Grading: The Danish 7-point scale Reexam: As ordinary
Thermoplastic Materials and Technologies [TMT1] – 5 ECTS	
The main purpose of the course is to enable the student to understand the basic characteristics of polymers, relate and use these characteristics to the design of parts, assemblies, and simple moulds, and understand and select relevant thermoplastic technologies with emphasis on injection moulding, with respect to functionality, economy and sustainability.	Oral group presentation followed by an individual oral evaluation Internal censor Grading: The Danish 7-point scale Reexam: As ordinary
Simulation of Injection Moulding of Thermoplastics (SIT1) – 5 ECTS	
The main purpose of the course is to give the student a basic understanding of the possibilities within mould flow simulations of thermoplastic polymers for injection moulding. Mould flow simulations help designers optimise the design of	Individual oral examination Internal censor Grading: The Danish 7-point scale Reexam: As ordinary

parts and moulds for injection moulding. The simulations provide information about mould filling, packing, cooling, warpage, flow rate, material viscosity etc.	
Mechanics of Composite Materials (MCM1) - 5ECTS	
The main purpose of the course is to enable students to understand the mechanics of a laminate and have a solid knowledge of the possibilities and limitations of the use of composite materials in products and structures. The course also enables students to work with moulds for composites and simulate fibre-reinforced composites using Ansys ACP	Individual oral examination Internal censor Grading: The Danish 7-point scale Reexam: As ordinary
Renewable Energy (ENE1) – 5ECTS	
The purpose of the course is to ensure that the student will understand the design and calculation of renewable energy plants with focus on energy production, energy savings and storage and environmental conditions.	Individual oral examination Internal censor Grading: The Danish 7-point scale Reexam: As ordinary
Design of Energy Systems (DES1) – 5ECTS	
The student will obtain knowledge and calculation practice of refrigeration and heat pump systems in order to be able to design an efficient, environmentally friendly energy plant.	Test + Course assignment with individual evaluation Internal censor Grading: The Danish 7-point scale Reexam: As ordinary
Sustainable Power Production (SPP1) – 5 ECTS	
The main purpose is to gain basic knowledge and design of sustainable power production with wind tur-bines, photovoltaic cells and batteries fuel cells, hydrogen storage, and smart grid.	Individual oral examination based on course assignment Internal censor Grading: The Danish 7-point scale Reexam: As ordinary
Innovation and Design of Products (IDP1) – 5 ECTS	
The main purpose of the course is to strengthen student's acquaintance with engineering procedures within the development and assessment of mechanical products from both redesign and conceptual design perspectives. Human-centered design thinking, business assessment and innovation strategies will be of emphasis.	Group exam with individual oral evaluation Internal censor Grading: The Danish 7-point scale Reexam: As ordinary
Finite Element Method, Advanced (FEM2) – 5 ECTS	
The main purpose of the course is to enable the student to solve nonlinear static problems and dynamic problems using the FE method and to give the student an overview of how a thermal analysis is performed using the FE method.	Individual oral examination Internal censor Grading: The Danish 7-point scale Reexam: As ordinary
Advanced Designing in 3D-CAD (CAD2) – 5 ECTS	
The main purpose of the course is to provide the student with the knowledge and methods within the fields of more advanced CAD application used in an industrial environment.	Test + Course assignment with individual evaluation Internal censor Grading: The Danish 7-point scale Reexam: As ordinary
Advanced Engineering Mathematics (AEM1) – 5 ECTS	
The purpose of this course is to give students a mathematical foundation for studying mechanical engineering beyond the Bachelor level. The focus is on a comprehensive introduction to partial differential equations and methods for their solution.	Individual written examination, 4 hours Internal censor Grading: The Danish 7-point scale

	Reexam: As ordinary
Automation, Mechanical Design AMD1	
The purpose is to be able to design and dimension advanced mechanical or hydrostatic drive systems and choose the practical useable components. The students will test theory in practice through some laboratory work to gain a deeper understanding of science issues.	Individual online test No censor Grading: The Danish 7-point scale Reexam: As ordinary
Geometrical Tolerancing and Inspection GTI1	
The main purpose of the course is to provide the student with the deep knowledge of GDT (-also called GPS) Geometrical Tolerancing and the physical inspection of GDT data. It is also the purpose to gain knowledge inside handling polygon data from scanning.	Individual written test + course assignment Internal censor Grading: The Danish 7-point scale Reexam: As ordinary (other exam forms may occur)
Circular Economy and LCA (SE-LCA1) – 5ECTS	
The purpose of this course is to: a) Provide the students with knowledge of the principles of Life Cycle Assessment (LCA), and how to carry out and interpret LCA analyses of chosen product and services relevant for engineers. b) Provide the students with knowledge of the principles and contents of Circular Economy (CE) and make them able to use this knowledge for business development in line with the UN Sustainable Development Goals (SGD). c) Learn how LCA analyses can be used in relation to making decisions leading to development of Circular Economies.	A case written exam Internal censor Grading: The Danish 7-point scale Reexam: New assignment evaluated as ordinary

The learning objectives of the courses (knowledge, skills and competencies) and further information about the form and conditions of the examination are given in Appendix 1.

7 The specializations of the education

The following specializations are offered at the Mechanical Engineering program:

- Intelligent Mechanics: Robots, Automation, Industry 4.0, Digitization
- Polymers Design: Lightweight constructions, plastic and composite materials
- Sustainable Energy: Wind turbines, solar heating, energy storage, CO2 reduction

Each specialization is associated with specific electives as well as the projects of 6 and 7 semesters.

A specialization consists of 2 electives (10 ECTS), 6th semester project (10 ECTS) and bachelor project including preparation (20 ECTS) a total of 40 ECTS.

Electives and specialization are created to the extent that there are sufficient students enrolled in the elective or specialization.

7.1 Specialization: Intelligent Mechanics and Systems

The interaction between man and technology is in focus and the student will work with the latest new technologies, robots, satellite communication, etc.

The development of intelligent products and systems is about integration between software, hardware, system development and mechanical engineering.

The keywords for the specialization are:

- Modelling and simulation of mechanical systems
- Control and regulation technology
- Monitoring systems
- Mechatronics
- Measurement technique and instrumentation
- Strength test
- Mobile hydraulics
- Optical recognition
- Robots
- Remote control
- Dynamic GPS
- Satellite communications

Contents:
Automatic Control, Digital Control and Simulation (AUC1)
Robotics and Multi Body Systems (RMS1)
System dynamics, Modelling and Simulation (SMC1)
6th semester project (SEP6): Robot programming, Lab. control and level control
Bachelor project (BPR1 + 2): Project in Intelligent Mechanics and Systems

Completion of this specialization entitles to a profile designation on the bachelor's degree.

7.2 Specialization: Polymers

Plastics belong to the family of polymeric materials and over the last century, materials such as metal, wood, glass, clay, cotton and wool have been replaced by polymeric materials due to their tailored properties and low cost.

Today, the polymers are included in so many products that it will be quite impossible to avoid contact with them in one form or another. But how do you make products from polymer materials? How is a cola bottle made?

The keywords for the specialization are:

- Thermoplastic
- Tempered plastic
- Technologies
- Simulation of injection moulding
- Design and development of items and tools
- Semester projects within thermo- or thermosetting plastics
- Collaboration with companies from the plastics industry

Contents:
Thermoplastic Materials and Technologies (TMT1)
Simulation of Injection Moulding of Thermoplastics (SIT1)
6th semester project (SEP6): Design and manufacture an injection moulded, thermoplastic or composite item
Bachelor project (BPR1 + 2): Project in Polymers

Completion of this specialization entitles to a profile designation on the bachelor's degree.

7.3 Specialization: Renewable Energy

The whole world's energy production is facing a dramatic shift from coal, oil and gas to energy sources that do not pollute the atmosphere with greenhouse gases. Development of the sustainable energy systems of the future is about energy from solar, wind, waves and CO2-neutral fuels such as straw and wood.

The student will work with basic energy technology, energy savings, design of energy plants and renewable energy technologies such as wind turbines, solar heat and solar cells, biomass and biogas, heat pumps and energy storage, etc.

The keywords for the specialization are:

- Energy consumption and energy savings
- Environment and greenhouse effect
- Pumps and piping systems
- Heat transmission and heat recovery
- Cogeneration and district heating systems
- CO2-neutral fuels
- Solar cells
- Solar heating system
- Cooling and heat pump technology
- Biogas
- Windmills
- Energy storage and fuel cells

Contents:
Design of Energy Systems (DES1)
Renewable Energy (ENE1)
Sustainable Power Systems (SPP1)
6th semester project (SEP6): Design and manufacture / test an energy component or an energy system.
Bachelor project (BPR1 + 2): Project within Sustainable Energy

Completion of this specialization entitles to a profile designation on the bachelor's degree.

8 Practical Workshop

Practical Workshop courses are practice-related courses lasting one week (not ECTS-triggering). The courses are completed in parallel with 1st-4th semesters. There are the following five courses:

- ME-PWS1 (1st semester): Turning and milling
- ME-PWS2 (2nd semester): Welding, cutting and bending
- ME-PWS3 (3rd semester): CNC machining
- ME-PWS4 (3rd semester): Electricity, hydraulics and pneumatics
- ME-PWS5 (4th semester): Energy and plastics

The learning objectives of the courses (knowledge, skills and competences) and form of examination are shown in Appendix 1

9 Bachelor Project

MA-BPR1
MA-BPR2

The programme concludes with a bachelor project (BPR2), which accounts for 15 of the education programme's total 210 ECTS and concludes with an examination. The bachelor project commences in the 6th semester (BPR1) with a choice of subject and preparation of a project description.

The bachelor project must demonstrate independent critical reflection within the chosen topic, and must document the student's ability to apply engineering theories and methods. The bachelor project must also reflect the student's ability to express themselves in an academic and structured manner within their subject.

A condition for being able to commence the bachelor project is the student being assessed as being likely ready for the examination, as BPR2 must be the last examination of the study.

As a rule, the bachelor project is prepared in groups of 3-4 people.

The bachelor project includes an independent experimental, empirical and/or theoretical treatment of a practical problem in connection with the central topics of the education programme.

The project must be documented in the form of a report containing a project basis, solution description, calculations, drawings, etc. If the report is a group assignment, it must be clear who wrote which sections of the report.

The students are examined in the project by oral examination/group test with individual assessment in accordance with the programme's overall goals as described in Section 1 of the Curriculum. The basis for examination is the bachelor project. It is a prerequisite for participation in the exam that the bachelor project is submitted within the stipulated deadline and meets the described criteria for the project.

Examinations can take place at the earliest when all the other examinations of the programme, including internships, have been passed. The examination is assessed according to the 7-point scale and with the participation of an external examiner. It is the student's own responsibility to keep track of the number of ECTS passed. The student cannot take the exam in BPR2 if there is a lack of passed ECTS.

10 Title and issue of degree

Graduates who have completed the programme of study according to this curriculum + joint regulations, are entitled to use the Title Bachelor of Engineering in Mechanical Engineering.

It is also possible to obtain the following special designations:

- Intelligent Mechanics and Systems
- Polymers
- Sustainable Energy

For completed education, VIA University College issues a diploma stating the title, direction and, if applicable specialty designation. In addition, information is provided on the scope of the sub-elements in ECTS, the result of the assessments achieved as well as the topics for the interdisciplinary project and the graduation project.

In the event of interrupted education, proof of passing study units is issued.

11 Appendix 1: Courses in the Mechanical Engineering Programme

1st Semester

Code	Title	ECTS	Knowledge	Skills	Competences	Assessment
ME-DIG1	Digitalisation 1	5	The student will acquire knowledge of the following: • The user interface and understanding of the structure in a 3D CAD-system • Use sketching, constraints and dimensions as basis for 3D features • Create geometrical features • Create assemblies • Create and edit 2D drawings for parts and assemblies • Use of CAD in Maker Space • Recognize and identify datatypes • Data acquisition with different sensors • Use of actuators in automatic processes • Basic knowledge about I/O as well as ADC and DAC	The student will acquire skills in: • Create 3D parts and assemblies in a 3D CAD-system • Assemble and document parts on a 2D drawing • Use digital twins in connection with 3D printers og CNC machines • Recognise and identify datatypes • Write, test and document simple scripts for controlling a microcontroller • Data acquisition • Use of sensors and actuators	After completing the course the student will be able to: • Use a 3D CAD program • Account for data flow and relate it to microcontroller systems • Design and implement simple circuits with microcontrollers, sensors and actuators.	Prerequisites for exam: Mandatory assignments approved by the teachers. Exam type: Individual written examDuration is 2 hoursThe exam counts for 100% of the final gradeInternal censor Tools allowed: All Re-exam: Same as ordinary

Code	Title	ECTS	Knowledge	Skills	Competences	Assessment
ME-TDE1	Technical Design	5	The student will acquire knowledge of the following: - Sketching of isometric views and doing simple developments - Using 3d CAD in technical drawing - Illustrating using the first quadrant method (European) - Dimensioning after known standards (DS/ISO 128, 129) - Using tolerances in relation to assemblies - Combine surface roughness with production methods - Weldment sections in relation to weld symbols - The use of geometrical toleranc-ing when design machine components - Structured drawing documentation (layout, assemblies, detail drawings and parts lists)	The student will acquire skills in: - Presenting technical documentation in 2D and 3D - Creating machine drawings according to DS/ISO 128/129 and using general tolerancing and fit tolerances - Define an describe machine components making sketches, drawings, assembly drawings and parts lists. - Identify and using standard parts in machine design	After completing the course, the student will be able to: - Present and sketch technical ideas - Construct a product from described criteria's - Argue technical solutions in a dialog with suppliers - Produce technical documentation for production - Understand production preparation of raw materials and have a dialog about production methods	Prerequisites for exam: All 14 mandatory assignments must be approved by the teacher. Exam type: Individual oral exam without preparation based on the final course assignment uploaded to Wiseflow.Duration is 20 minutesThe exam counts for 100% of the final gradeInternal censor Tools allowed: All Re-exam: Same as ordinary

Code	Title	ECTS	Knowledge	Skills	Competences	Assessment
ME-MEC1	Mechanics 1	5	The student acquires knowledge of basic statics within the following: • Description and calculation of force systems, forces, moments, couples and resultants. • Formulation and description of static equilibrium, supports, free body diagram and equilibrium conditions. • The application of join method and section method applied to plane trusses, force calculation in frames and machines. • Definition and calculation of distributed loads, area centroid, external loads on beams, and internal forces in beams. • Identification and formulation of equations for normal force, shear force and bending moment. • Analysis of relationships between load, shear force and bending moment. • Use of cross-sectional constants and material strength values in dimensioning. • Identification and calculation of normal stress, shear stress, Von Misses stress and allowable stress. • Description of dry friction.	The student who completes the course acquires skills in: • Making free body diagrams and formulate static equilibrium equations. • Calculate reactions and determine internal forces in simple structures, which are statically determined. • Dimension and design simple structures and choose materials based on the material's strength values. • Provide calculation documentation in a technical report.	After the course, the student must be able to: • Perform analysis of mechanical loads as a starting point for the design and dimensioning of a simple product. • Be able to take part in projects concerning simple design and dimensioning tasks.	Prerequisites for exam: None Exam type: Individual oral exam based on solving an assignment found by drawing lots. The duration is approx. 20 minutes. No preparation time for the exam. The exam assignments are handed out at least one week before the exam. Exam counts 100% of the final grade. Internal censor Tools allowed: None, however, the course textbooks will be available in the exam room. Re-exam: As ordinary

Code	Title	ECTS	Knowledge	Skills	Competences	Assessment
ME-MMT1	Materials and Technologies	5	After completing the course, the student will be able to: • Explain metals' mechanical properties • Explain the increase of strength in metals • Explain the relation between deformation, stress and fracture in tension loaded materials • Explain materials' failure • Explain forging • Explain assembly and fastening • Explain machining • Explain fast prototyping • Explain cost price and calculation • Explain greenhouse effect • Explain circular economy and the sustainable circles • Explain and make a simple life cycle analysis • Explain United Nations Sustainable Goals • Use Edupack program	After completing the course, the student will gain skills in: • Select an appropriate type of steel for manufacturing of components. • Select an appropriate strength increasing method. • Perform common tests for materials. • Select suitable technological processes based on production volume, geometry, surface requirements, tolerance requirements, load situation, etc. in relation to environmental impact and the sustainable principles. • Explain the function of different types of production equipment. • Estimate the cost price of products. • Perform a simple life cycle analysis of a product. • Use Edupack program for selection of materials and technologies	After the course, the student must be able to: • Select suitable materials and design components based on their mechanical properties as well as their manufacturing and machining technologies in relation to the sustainability principles. • Furthermore, the student must be able to independently apply, assess, and acquire new knowledge within the subject.	Prerequisites for exam: The laboratory report must be submitted on time and must be approved by the lecturer. Exam type: Individual oral exam, without preparation. Duration approx. 25 minutes Exam counts 100% of the final grade Internal co-examiner Weighting: The material part and the technology part each weigh 50% of the total grade. Tools allowed: All Re-exam: As the ordinary exam

Code	Title	ECTS	Knowledge	Skills	Competences	Assessment
ME-SEP1	Semester Project 1	10	**Professional:** Knows theories, models and methods from the courses in relation to the solution of the semester project assignment. Product development: Including requirements, criteria and properties Idea generation methods - unsystematic (eg Brainstorming) and systematic (eg Morphology). Presentation: Can convey concepts and principles regarding technical communication in written and oral form, including structuring, drawing and calculation documentation. **Process:** Effective teams: Can account for involved theories of group dynamics, team collaboration and conflict resolution. Own learning process: Can refer to involved theories about learning, motivation, feedback and study techniques. Project framework: Can identify relevant knowledge in relation to academic and technical written communication, including the report's structure, references and source management. Can identify relevant presentation techniques for the target group, as well as use presentation techniques. PBL: Can explain basic elements within PBL. Can identify relevant issues and specific requirements for a problem formulation.	**Professional:** Can select theories, models and methods from the disciplines and apply them in a form that is both relevant and rational in relation to the solution of the semester project assignment The following skills from the subjects are used, among others: - Compilation of free body diagrams - Dimensioning, design and functionality - Material selection and production methods - 3d and 2d drawing documentation according to current rules - Structured presentation of drawings and calculations **Process:** Effective teams: Can jointly formulate and apply a group contract in the group work. Can be part of and establish collaboration with project group and supervisor Own learning process: Can apply knowledge of learning theory and motivation theory in connection with own learning process as well as give and receive feedback. Project framework: Can act source-critically as well as use references and source management - including avoiding plagiarism. Can convey the results of the project work and the project group's learning process in a structured way using	**Professional:** Can select, combine and adapt theories, models and methods from the subjects and apply them in a form that is usable, relevant and rational in relation to the solution of the semester project assignment Can design and dimension a product based on analysis of mechanical loads. Can provide a structured presentation of drawings and calculations **Process:** Effective teams: Can describe and reflect on the project group's collaboration - including their own efforts - to define opportunities for improvement for future projects. Own learning process: Can reflect on own ability to learn through the various teaching activities, including the project group's work. PBL: Can take responsibility for the student-led part of the semester project.	Prerequisites for exam: The project report and process report must be submitted before deadline. Exam type: Oral group exam with individual assessment. Group presentation, approximately 20 minutes followed by a group examination, approximately 20 minutes per student including voting. Grades are given on the basis of the work submitted as well as the individual's performance during the examination. Internal censor Tools allowed: All Re-exam: Last Friday in June an information meeting will be held for students who have not passed the semester project either in January or June. Here, information is provided on specific deadlines and details, just as new project groups are formed where possible in relation to the number of failed students in the individual semesters. Based on the feedback the students have received after the ordinary exam, either a new project must be prepared or the non-passed project can be improved. The project must be submitted in mid-August (exact date and time is to be announced at the information meeting). There will not be supervisors available for supervision at the reexams. The project will be evaluated at an oral re-examination in September.

Code	Title	ECTS	Knowledge	Skills	Competences	Assessment
			Project management: Can identify relevant project management methods, including planning, meeting management, risk assessment and quality assurance.	professional concepts, both written, graphic and oral. Can communicate in writing and orally to different target groups. PBL: Can set up a problem formulation, describe different solution options and explain solution proposals. Project management: Can account for the choice of and use of tools and methods for project management to achieve specific goals in the project work.		