Bring Ideas to Life
VIA University College

August 2023

Curriculum

Programme section

Bachelor of Engineering
Climate and Supply Engineering

Applicable to students enrolled in August 2023 and later.

Students enrolled before August 2023 will follow the structure and subjects of the curriculum 2021.

*) Later updates:
August 2025 exam description semester projects

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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:

- Translate technical research results as well as scientific and technical knowledge into 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 societal, economic, environmental and occupational health and safety 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's 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 actualised 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 manage 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

We educate and train the future engineers to manage climate change through sustainable solutions within supply of water and district heating as well as wastewater treatment.

The aim of the programme is to educate engineers with basic knowledge of climate change and sustainability within design and management of projects for
- Drinking Water Production
- Wastewater Treatment
- Distribution of water, wastewater, and district heating

The degree programme focuses on the use of digital tools for the design and simulation of processes and systems.

The aim of the programme is also to educate independent and problem-oriented graduates with competencies in applying the profession's methodologies, communicating with stakeholders and in a multidisciplinary manner, as well as being part of national and international teams.

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 conducted 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.

Online/virtual elements can be included in the teaching.

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.

The reading of study material requires English B-level to complete the programme.

New students are admitted every year in August.

The study includes:
- Compulsory courses and projects
- Elective courses
- Internship
- Bachelor project
- Workshops

One semester consists of 3-4 delimited courses. One course may have a volume of 5 to 10 ECTS points, and a project may have a volume of 10 to 20 ECTS points.

The course purpose, scope, learning objectives and exams are described in this curriculum.

The programme also includes practical workshops, see section 8.

The programme is structured as illustrated below:

Semester Theme	Course	Course	Course	Course/project	Course
7. Electives	Elective course	Elective course	Elective course	SE-BPR2 Bachelor project	
6. Electives	SE-TEN1 Tendering and contracting	Elective course	Elective course	SE-BPR1 Bachelor Project Preparation course	ENG-IDE1 Semester Project Innovation and Entrepreneurship
5. Internship	SE-INP1 Internship				
4. Urban Infrastructure and Climate Adaptation	SE-TMP2 Environmental Data and Python programming	SE- MSC1 Materials Science and Corrosion	SE-VVM1 Environmental Assessment	SE-SUD1 Sustainable Drainage	SE-SEP4 Semester Project
3. Process Engineering	SE-TMP1 Thermodynamics, Process Engineering and District Heating	SE-BUD2 Water and Wastewater Processes and Mass Balances	SE-CMI1 Chemistry and Microbiology	SE-HYD2 Optimisation of Pipeline Networks	SE-SEP3 Semester Project
2. Climate Change Adaptation and Supply Infrastructure	SE-SCI2 Calculus, Linear Algebra and Dynamics	SE-INF1 Infrastructure	SE-CPL1 Climate planning and the Utility Sector	SE-HYD1 Basic Hydraulics	SE-SEP2 Semester Project
1. Sustainable Urban Development	SE-SCI1 Mathematical Analysis	SE-BUD1 Basic Utility Design	SE-CIA1 Climate Change, Impacts, and Adaptation	SE-GEO1 Basic Geology and Historical Climate Development	SE-SEP1 Semester Project

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. Within these 10 ECTS, there will be input in the form of video, online lectures, learning paths, etc. covering up to 2.5 ECTS credits, which are expected to be completed and discussed together with the supervisor(s). The amount of input will vary from semester to semester.

The overall purpose of the semester project is to link the semester's courses to a whole. Study techniques, project management, methodology, theory of science, research methods and teamwork will be introduced as input throughout the study in connection with the semester projects.

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

1. Semester: Sustainable Urban Development
2. Semester: Climate Change Adaptation and Supply Infrastructure
3. Semester: Process Engineering
4. Semester: Analysis of a Supply District Area

5.1 1st semester: Sustainable Urban Development

The overall theme of the 1st semester is 'Introduction to climate change and sustainable supply'.

Expanding cities are a challenge – how can we accommodate that growth in a sustainable way?

In this context the semester project focuses on turning a green field into an environmentally friendly residential area. The amount of water, wastewater and district heating must be forecasted in order to balance supply and demand. Additionally, storm water must be handled locally.

Purpose, ECTS and assessment:

Mathematical Analysis (SE-SCI1) – 5 ECTS	**Assessment**
The course aims to prepare the student for further studies in Climate and Supply Engineering. Furthermore, the purpose is to enable the student to read and interpret technical literature, which use mathematics.	Exam prerequisites: None Type of exam: Individual written exam, 4 hours. External assessment. Allowed tools: The exam set will state in which assignments CAS programs may not be used (Condition A) and in which assignments CAS programs may be used (Condition B). It is not allowed to use AI chatbots such as ChatGPT and similar aids. Condition A: Calculation expressions and intermediate calculations must be shown. The PC, including the PC's mathematics programs, may be used as a writing tool for entering the answers to the tasks. In addition, the calculator and PC may only be used for check calculations. Condition B: Calculation expressions must be shown. Calculator and PC may be used. Re-exam: Equal to the ordinary exam.

Climate Change, Impacts, and Adaptation (SE-CIA1) – 5 ECTS	
The student must gain a basic understanding of the causes of climate change, its consequences and what methods can be used to mitigate it. The student will be introduced to the key professional GIS tools used for mapping and planning within climate adaptation.	Exam prerequisites: None Type of exam: Ongoing assessment of three written assignments, handed in according to deadline and a final exam consisting of a written course assignment, each weighing 25%. Internal assessment. Tools allowed: -All Re-exam: Individual oral exam, 20 minutes, with internal assessment.
Basic Utility Design (SE-BUD1) – 5 ECTS	
Humans are dependent on clean drinking water, clean energy and removal of contaminants from wastewater. This course gives a basic introduction to the resources the demand calculations and main processes in drinking water and wastewater utility companies.	Exam prerequisites: None Type of exam: Ongoing assessment of three written assignments, handed in according to deadline and a final exam in the form of a written assignment, each weighing 25%. Internal assessment. Tools allowed: NA Re-exam: Individual oral exam, 20 minutes, with internal assessment.
Basic Geology and Historical Climate Development (SE-GEO1) – 5 ECTS	
The course aims to provide a basic knowledge of geology, soils and their properties related to the hydrological cycle. It also introduces historical climate change and its causes and effects.	Exam prerequisites: None Type of exam: Ongoing assessment of two written assignments, handed in according to deadline and a final exam in the form of a written test, each weighing 1/3. Internal assessment. Tools allowed: All Re-exam: Individual oral exam, 20 minutes, on the basis of the afore-mentioned assignments. Internal assessment.
Semester Project (SE-SEP1) – 10 ECTS	
Expanding cities are a challenge – how can we accommodate that growth in a sustainable way? In this context the semester project focuses on turning a green field into an environmentally friendly residential area. The amount of drinking water and wastewater must be forecasted in order to balance supply and demand. Additionally, rainwater must be handled locally.	Exam prerequisites: Project description must be duly handed in and approved. Type of exam: Group exam with individual assessment based on project report and process report submitted before the deadline and in accordance with VIA Engineering guidelines including guidelines on formalities. Students' individual weighting of academic subjects must be specified in the process report. Group presentation approx. 20 minutes, followed by joint exam with joint discussion and individual question rounds for approx. 20 minutes per student including voting.

The focus of the PBL teaching in SEP1 is LEARNING TO LEARN, project methodology and PBL, including a basic introduction to study techniques and team-based project work.	During the oral exam, each student is expected to demonstrate ownership of the project by providing detailed explanations and reflections in response to questions posed by the examiner. Individual assessment based on an overall assessment of the submitted work and the individual's performance during the test. Internal assessment Tools allowed: All Re-exam: Same as the ordinary exam. Based on the submitted project, the examiner gives the student guidance on necessary improvements in relation to passing the exam (possibly, that a new project should be prepared). The students are informed about specific deadlines and details of the project work. Project groups are formed if possible. No guidance is provided in the period leading up to submission. The project is assessed at an oral exam.

The learning objectives of the courses (knowledge, skills and competencies) are further described in Appendix 1.

5.2 2nd semester: Climate Change Adaptation and Supply Infrastructure

The overall theme of the 2nd semester is “Sustainable infrastructural Planning.”
The students will complete a project, where they must plan an infrastructural project assignment.

The project aims to provide students with the understanding of a basic concept of planning and distribution of supply lines for drinking water and district heating supply, and for a management of wastewater and rainwater. Besides, students will use basic concepts for designing road cross section and engineering geology methods used for road construction.

Purpose, ECTS and assessment:

Calculus, Linear Algebra and Dynamics (SE-SCI2) – 5 ECTS	**Assessment**
The course aims to prepare the student for further studies in Climate and Supply Engineering. Furthermore, the purpose is to enable the student to read and interpret technical literature, which use mathematics.	Exam prerequisites: None Type of exam: Individual oral exam, 20 minutes. The exam is on the basis of course assignments found by lot and without preparation. The course assignments are selected by the examiner and communicated to the students no later than the last day of teaching on VIA's intranet. Course assignments must be uploaded in WISEflow approx. 1 week before the exam. If the student does not upload the course assignments in WISEflow, the student is offered to solve the course assignments during the exam. Internal assessment. Tools allowed: None Re-exams: Equal to the ordinary exam.

Basic Hydraulics **(SE-HYD1) – 5 ECTS**	
The course aims to provide students with understanding of basic hydraulics and design urban sewer systems. Furthermore, the students learn to use Mike Urban to analyse and design sewer systems.	Exam prerequisites: None Type of exam: Ongoing assessment of 2 individual written assignments, each weighing 15% of the final grade. A final exam in the form of one hand-in mandatory group assignment (a Mike Urban project) in the end of the semester, which counts for 70% of final grade. Internal assessment. Tools allowed: All Re-exams: 3-hour written exam, no aids. Alternatively, the program may decide to have an oral exam.
Infrastructure **(SE-INF1) – 5 ECTS**	
The course aims to provide the student with an understanding of basic concepts within road constructions, including pipe design and dimensioning. Furthermore, the students will receive introduction to CAD programs used for geometrical design of roads and other infrastructure planning.	Exam prerequisites: None Exam type: Ongoing assessment of two written individual/ group assignments, each weighing 50%. Internal assessment Tools allowed: All Re-exam: Individual oral exam, 20 minutes, based on course content.
Climate Planning and the Utility Sector **(SE-CPL1) – 5 ECTS**	
The student must gain a basic understanding of urban climate adaptation strategy, including fundamental concepts in municipal climate adaptation planning, climate adaptation mapping techniques, urban infrastructure planning including sewage systems. Moreover, students will develop practical skills in plan analysis, using GIS tools for analysis, devising local-level rainwater disposal plans, and articulating solutions aligned with sustainability goals.	Prerequisites: None. Type of exam: Ongoing assessment of two written assignments, each weighing 25%, and an exam in the form of a written assignment, weighing 50%. All three assignments must be submitted in Itslearning according to deadline. Internal assessment. In spring semester 2024 each assignments weighted 1/3. Tools allowed: All Re-exam: Individual oral exam, 20 minutes, based on course content.
Semester project **(SE-SEP2) – 10 ects**	
The urban development from first semester must now be equipped with an infrastructure to supply/handle the calculated amounts of drinking water, wastewater and rainwater. Furthermore, roads need to be designed for transport in and out of the area. The necessary infrastructure must be dimensioned and designed in a way that takes sustainability, legislation and environment into account.	Exam prerequisites: Project description must be duly handed in and approved. Type of exam: Group exam with individual assessment based on project report and process report submitted before the deadline and in accordance with VIA Engineering guidelines including guidelines on formalities. Students' individual weighting of academic subjects must be specified in the process report. Group presentation approx. 20 minutes, followed by joint exam with joint discussion and individual question rounds for approx. 20 minutes per student including voting.

The purpose of the PBL part of the course is to promote the students' competencies in cross-professional collaboration.	During the oral exam, each student is expected to demonstrate ownership of the project by providing detailed explanations and reflections in response to questions posed by the examiner (added august 2025). Individual assessment based on an overall assessment of the submitted work and the individual's performance during the test. External assessment Tools allowed: All. Re-exam: Same as the ordinary exam. Based on the submitted project, the examiner gives the student guidance on necessary improvements in relation to passing the exam (possibly, that a new project should be prepared). The students are informed about specific deadlines and details of the project work. Project groups are formed if possible. No guidance is provided in the period leading up to submission. The project is assessed at an oral exam.

The learning objectives of the courses (knowledge, skills and competencies) are further described in Appendix 1.

5.3 3rd semester: Process Engineering

The overall theme of the 3rd semester is processes in water, wastewater, and energy supply systems.

The students will complete a project with focus on analyses and calculations of processes related to optimising an existing supply process (drinking water, wastewater, or district heating).

Purpose, ECTS and assessment:

Thermodynamics, Process Engineering and District Heating (SE-TMP1) – 5 ECTS	**Assessment**
The course aims to provide students with competences in analysing and optimization of district heating processes and systems using process diagrams, energy balance and thermodynamics theory. In addition, the purpose is to enable the student to read and interpret academic literature as well as communicate about processes, thermodynamics and district heating.	Exam prerequisites: None Type of exam: Individual oral exam, 20 min. with internal assessment. The exam is on the basis of course assignments found by lot and without preparation. The course assignments are selected by the examiner and communicated to the students no later than the last day of teaching on VIA's intranet. Course assignments must be uploaded in WISEflow approx. 1 week before the exam. If the student does not upload the course assignments in WISEflow, the student is offered to solve the course assignments during the exam. Tools allowed: None Re-exams: Equal to the ordinary exam.

Optimisation of Pipeline Networks (SE-HYD2) – 5 ECTS	
To provide the students an understanding on control and regulation of pumps, valves and gates in large hydraulic systems. Avoid floodings caused by climate based floodings. Provide the students with knowledge on how to calculate pollutions from sewer systems. Introduce the students in modelling and control of pressurized pipe network in order to reduce leaks and energy consumption.	Exam prerequisites: None Type of exam: Individually oral exam, 20 minutes, on the basis of two course assignments, handed in before deadline. Internal assessment Tools allowed: None Re-exams: Same as the ordinary exam
Water and Waste Water Processes and Mass Balances (SE-BUD2) – 5 ECTS	
Quality of the drinking water distributed among consumers is highly dependent on the processes involved in raw water treatment. The quality of the raw water depends on the source of water. Wastewater that is going through wastewater treatment plant has special quality requirements before it is discharged to recipients. This course gives an insight in the processes involved in drinking water and waste water treatment and evaluates on the performance of already existing treatment plants and their design.	Exam prerequisites: Four mandatory assignments, handed in before deadline and approved. Exam type: Individual oral exam, 20 minutes. Internal assessment Tools allowed: None Re-exam: Same as the ordinary exam.
Chemistry and Microbiology (SE-CMI1) – 5 ECTS	
The course aims to provide the students with a background in basic chemistry and microbiology which can be applied to the fields of drinking water, wastewater, and district heating.	Exam prerequisites: Course participation min 75%. If the exam prerequisites are not met, the student must submit written answers to assignments on the subject from each of the missed lectures in order to be eligible for the re-examination. These assignments are scheduled after the regular examination. Exam type: Written exam in total 4 hours, composed of two parts: 1-hour multiple choice and 3 hours written exam External assessment. Tools allowed: No material aids allowed during 1-hour multiple choice exam All material aids allowed during 3-hours written exam with the exception of internet and smart phones. Re-exam: Equal to the ordinary exam.
Semester project (SE-SEP3) – 10 ECTS	
The purpose is for the student to be able to analyse an existing supply process (drinking water, wastewater or district heating) and to suggest optimizations. The purpose of the PBL part of the course is to promote the students' independent knowledge application, critical thinking and holistic understanding with a focus on the UN's global goals.	Exam prerequisites: Project description must be duly handed in and approved. Type of exam: Group exam with individual assessment based on project report and process report submitted before the deadline and in accordance with VIA Engineering guidelines including guidelines on formalities. Students' individual weighting of academic subjects must be specified in the process report. Group presentation approx. 20 minutes, followed by joint exam with joint discussion and individual question rounds for approx. 20

	minutes per student including voting. During the oral exam, each student is expected to demonstrate ownership of the project by providing detailed explanations and reflections in response to questions posed by the examiner. Individual assessment based on an overall assessment of the submitted work and the individual's performance during the oral exam. External assessment Tools allowed: All Re-exam: Same as the ordinary exam. Based on the submitted project, the examiner gives the student guidance on necessary improvements in relation to passing the exam (possibly, that a new project should be prepared). The students are informed about specific deadlines and details of the project work. Project groups are formed if possible. No guidance is provided in the period leading up to submission. The project is assessed at an oral exam.

The learning objectives of the courses (knowledge, skills, and competencies) are further described in Appendix 1.

5.4 4th semester: Urban Infrastructure and Climate Adaptation

The overall theme for the 4th semester is "Urban Infrastructure and Climate Adaptation".

Project work is being carried out to focus on upgrading of infrastructure and climate adaptation in urban areas with associated design, adaptation and modelling of the supply systems.

Purpose, ECTS and assessment:

Environmental Data & Python programming (SE-TMP2) – 5 ECTS	**Assessment**
The purpose of the course is to give the students skills and competencies in collecting, organizing, analysing and presenting data to design and optimize technical solutions and processes within the climate and utilities sectors.	Exam prerequisites: None Type of exam: Individual oral exam, 20 minutes. The exam is on the basis of two course assignments found by lot and without preparation. Ten course assignments must be uploaded in WISEflow approx. one week before the exam. If the student does not upload the course assignments in WISEflow, the student is offered to solve the course assignments during the exam. The assessment is based solely on the student's oral performance. Internal assessment. Tools allowed: None Re-exam: Same as the ordinary exam

Sustainable Drainage (SE-SUD1) – 5 ECTS	
The course aims to give the students a basic understanding of how the change in climate will impact the dewatering of cities. The focus will be on sustainable methods - including no-dig repair of existing pipelines.	Exam prerequisites: None Type of exam: Ongoing tests in the form of three written assignments, each weighing 10% and an exam in the form of a major written assignment weighing 70%. All assignments must be handed in before deadline. Tools allowed: All Re-exam: Individual oral exam
Environmental Assessment (SE-VVM1) – 5 ECTS	
The purpose of this course is to provide the students with knowledge on environmental management according to EU legislation on Environmental Impact Assessment (EIA) as well as permitting process relevant to supply engineering projects.	Exam prerequisites: None Exam type: Oral exam, 20 minutes, based on a submitted assignment. The assignment is handed out to the students one week before the exam and must be submitted in WISEflow approximately two days before the exam, according to deadline. Internal assessment. Tools allowed: The handed in project Re-exam: Same as the ordinary exam.
Materials Science and Corrosion (SE-MSC1) – 5 ECTS	
The course aims to provide the student with a basic knowledge of materials and products used in the supply industry and their degradation mechanisms.	Exam prerequisites: Course attendance min 75% If the exam prerequisites are not met, the student must hand in a written assignment on the subject from each of the missing lessons, to qualify for the re-exam. This assignment will be scheduled after the ordinary exam. Type of exam: Assessed on the basis of two oral assignments and one written assignment during the course and one final test in the form of a written course assignment. All four weighing equally. Internal assessment Tools allowed: All Re-exam: Oral re-exam based upon a subject found by draw, 20 min. with no preparation. Internal assessment
Semester project (SE-SEP4) – 10 ECTS	
Based on a large municipal climate adaptation project, the existing infrastructure must be adapted and renovated. Necessary rerouting of traffic, drinking water, rainwater, wastewater and district heating pipes must be planned. Initiatives for sustainable management of rainwater upstream of the project area	Exam prerequisites: The project description must be submitted according to the deadline and approved. Type of exam: Group exam with individual assessment based on project report and process report submitted before the deadline and in accordance with VIA Engineering guidelines including guidelines on formalities.

can be included. The purpose of the PBL part of the course is to promote the students' competencies in collaboration between and across different disciplines that are part of a large infrastructure project.	The students' individual weighting of academic topics must be specified in the process report. Group presentation approx. 20 minutes followed by joint evaluation with joint discussion and individual Q&A sessions for approx. 20 minutes per student including deliberation. During the oral exam, each student is expected to demonstrate ownership of the project by providing detailed explanations and reflections in response to questions posed by the examiner. Individual grades are given based on an overall assessment of the submitted work and the individual's presentation during the exam. External assessment. Tools allowed: All Re-exam: Based on the submitted project, the examiner gives the student guidance on necessary improvements in relation to being able to pass the exam (possibly that a new project should be prepared). The students are informed about specific deadlines and detailed progress for the project work. Project groups are formed if possible. No guidance is provided in the period leading up to submission. The project is assessed by an oral re-exam based on the updated/new project.

The learning objectives of the courses (knowledge, skills and competencies) are further described in Appendix 1.

6 Internship, 5th semester

SE-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. Internship must have a duration of at least 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 will find 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.

Internal assessment (pass/fail) based on the following elements:
• Internship work tasks
• Company presentation
• Internship report
• Participation in workshop for future interns

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.

7 6th-7th semesters

On 6th and 7th semester, students may specialise their education by choosing elective courses within the same subject area. Alternatively, they can choose freely between all subject areas.

Compulsory courses/projects are listed in section 7.1.
Electives are listed in section 7.2.
A detailed description of the individual courses can be found in the course-descriptions.

Students may choose one course of 5 ECTS among elective courses offered by VIA's other programmes. However, this does not apply to courses where the main content consists of material from the student's previous course of study. Any choice of course from another study programme must be approved by an Engineering student counsellor, in order to secure the relevance and an increasing academic level. Courses listed in section 7.2 are exempted from this rule.

7.1 Compulsory courses and projects

Compulsory courses at 6./7. Semester, for all students on Climate and Supply Engineering programme.

Purpose, ECTS and assessment:

Title (code)	Purpose / Content	Scope	Assessment
Tendering and Contracting (SE-TEN1)	This course equips students with specialized knowledge and practical skills to navigate tendering and procurement processes in climate adaptation, utility infrastructure, and building projects. Students will learn how to prepare, manage, and evaluate tender documentation within the legal frameworks applicable at national and EU levels, with an emphasis on sustainable and utility services.	5 ECTS	Exam prerequisites: None Type of exam: Oral group exam with individual assessment. Group presentation (approx. 5 minutes per student), followed by joint evaluation with joint discussion and individual Q&A sessions for approx. 10 minutes per student assessment included. Each student is expected to demonstrate their knowledge during the oral exam by providing detailed explanations and reflections in response to the examiner's questions. External assessment Tools allowed: All Re-exam: Individual oral exam, 20 minutes.
Semester Project (ENG-IDE1)	A cross-sectoral semester project that aims to develop and document an across disciplinary innovation and entrepreneurship project based on primary data collection.	10 ECTS	Exam prerequisites Hand in 6 written assignments in English to be approved in WISEflow before deadline. Type of exam: Exam is based upon the IDE1-report submitted in WISEflow before deadline. The group presents their prototype/pretotype. The exam room can be customized by the group to support the presentation. The exam is in English. Group exam with individual assessment. Group presentation approx. 15 minutes followed by joint evaluation with joint discussion and individual question rounds for approx. 60 minutes per group including assessment.

			Individual grades are given based on an overall assessment of the submitted work as well as the individual's presentation during the exam. External assessment. Tools allowed: All. Re-exam: Based on the submitted project, the examiner gives the student guidance on necessary improvements in relation to passing the exam (possibly, that a new project should be prepared). The students are informed about specific deadlines and details of the project work. Project groups are formed if possible. No further guidance is provided in the period leading up to submission. The project is assessed at an oral project exam.
Bachelor Project Preparation Course (SE-BPR1)	The main purpose of this 6th semester course is to prepare the student for their bachelor project – which will be carried out during the final semester. Preparation includes selecting the subject and choosing a project group for the bachelor project. During this course the project group develop their bachelor project description including finding external partners and collecting knowledge and data, to be prepared for starting up the bachelor project. The project group must consist of 2-6 students and should be carried out in association with an external partner. The purpose of the PBL part of the course is for the students to apply their personal and project skills gained from previous semester projects. Furthermore, they gain an understanding of the theory of science in relation to methods used in the bachelor project.	5 ECTS	Exam prerequisites: Approved 45-minute individual multiple choice test on Philosophy of Science. No aids allowed during this test. Type of exam: Group exam with individual assessment based on the bachelor project description submitted before the deadline. Group presentation approx. 15 minutes, followed by joint exam with joint discussion and individual question rounds for approx. 15 minutes per group including voting. Individual assessment based on an overall assessment of the submitted work and the individual's performance during the oral exam. Internal assessment Tools allowed: All Re-exam: Same as the ordinary exam.
Bachelor Project (SE-BPR2)	Carrying out the bachelor project, applying personal and project competencies from the previous semester projects in a practice-oriented and complex bachelor project.	15 ECTS	Exam prerequisites: Passed all other elements of the bachelor programme. Type of exam: Group exam with individual assessment. Exam is based on project report and process report submitted before the deadline and in accordance with VIA Engineering guidelines including guidelines on formalities. Group presentation, 20 minutes, followed by an individual exam, 20 minutes per student, with the presence of the whole group. During the oral exam, each student is expected to demonstrate ownership of the project by providing detailed explanations and reflections in response to questions posed by the examiner.

			Individual grades are given based on an overall assessment of the submitted work as well as the individual´s performance during the exam. External assessment. Tools allowed: All tools allowed. Re-exam: Same as the ordinary exam. Based on the submitted project, the examiner gives the student guidance on necessary improvements in relation to passing the exam (possibly, that a new project should be prepared). The students are informed about specific deadlines and details of the project work. Project groups are formed if possible. No guidance is provided in the period leading up to submission. The project is assessed at an oral exam.

The learning objectives of the courses (knowledge, skills and competencies) are further described in Appendix 1.

7.2 Electives

The Climate and Supply Engineering programme provides a selection of the following electives.

Electives run if there are sufficient number of registered students.

All electives have a scope of 5 ECTS.

Purpose, ECTS and assessment:

Title (code)	Content	Assessment
Advanced Water Treatment (SE-AWT1)	Through information retrieval, discussions, presentations and laboratory exercises to provide the student with knowledge in and hands-on experience with current topics related to drinking water quality. The focus will be on drinking water treatment methods more advanced than the traditional aeration and bio-sand filter. The methods may be filtration, sorption, precipitation, disinfection, etc.	Exam prerequisites: None Type of exam: Individual oral exam, 20 minutes, with an internal examiner. Exam is without preparation and based upon course assignment(s) (Experimental reports) handed in before deadline and accepted. Course assignments account for 50% of final grade. Exam accounts for 50% of final grade. Tools allowed: All Re-exam: Equal to the ordinary exam.
Applied Drinking Water Quality (SE-ADW1)	Through information retrieval, discussions, presentations and laboratory exercises to provide the student with knowledge in and hands-on experience with current topics related to drinking water quality.	Exam prerequisites: None Type of exam: Individual oral exam, 20 minutes, with an internal examiner. Exam is without preparation and based on Drinking Water Quality Report. Report must be handed in before deadline. Graded on the basis of an overall assessment of the submitted work as well as the individual's performance during the exam.

		Tools allowed: None Re-exam: Equal to the ordinary exam.
Applied Wastewater Quality (SE-AWW1)	Through information retrieval, discussions, presentations and laboratory exercises to provide the student with knowledge in and hands-on experience with current topics related to wastewater quality.	Exam prerequisites: None Type of exam: Individual oral exam, 20 minutes. Exam is without preparation and based on Wastewater Quality Report. Report must be handed in before deadline. Graded on the basis of an overall assessment of the submitted work as well as the individual's performance during the exam. Internal assessment. Tools allowed: None Re-exam: Equal to the ordinary exam.
Design & Simulation of District Heating System (SE-DSD1)	The student will obtain knowledge of energy storage systems and be able to make analysis/simulations of thermal energy storage and non-stationary energy systems.	Exam prerequisites: Two course assignments approved. Type of exam: Individual oral exam, 20 min., based on one course assignment handed in before deadline. Internal assessment. Tools allowed: None Re-exam: Equal to the ordinary exam.
Design of Energy Systems (ME-DES1)	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.	Exam prerequisites: Mandatory assignments. If the assignments are not handed in and approved by the deadline set by the lecturer, the prerequisites are not met, and new assignment and deadline will be set before the re-exam. Type of exam: The final exam (20 minutes) will count 100%. The final exam divided into: a. Individual oral evaluation on a mini project handed in before deadline (50%) b. Additional question from draw on the spot (50%) Internal assessment Tools allowed: All Re-exam: Equal to the ordinary exam.
Design of Wastewater Treatment Plant (SE-DWT1)	Through information retrieval, discussions and presentations to provide student with knowledge in planning establishment and design a proper waste water treatment plant (WWTP) for achieving a current wastewater quality.	Exam prerequisites: None Type of exam: Ongoing tests in the form of one presentation, weighing 30% and one written assignment, weighing 70%. All assignments must be handed in before deadline. Internal assessment. Tools allowed: All

		Re-exam: Equal to the ordinary assessment (new assignments).
Design of Wastewater Treatment 2 (SE-DWT2)	To create an understanding of the design of main wastewater treatment processes at the activated sludge plant and the importance of digital models used for this design. Through information retrieval and group work to provide student with knowledge about modelling program used for design and evaluation of wastewater treatment plant performance.	Exam prerequisites: None Type of exam: *A24, winter exam 2025:* Ongoing tests in the form of one written group assignment, weighing 100%. *A25, winter exam 2026:* Ongoing tests in the form of: 1. one group written assignments, weighing 50% 2. one group presentation, weighing 20% 3. Individual oral examination, weighing 30% Assignment must be handed in before deadline. Internal assessment. Tools allowed: All Re-exam: Equal to the ordinary assessment (new assignments).
Geophysics and Pump Test (SE-GPT1)	Prepare the students to be able to address the geophysical and hydrological questions related to establishing a new source location or protection of an existing location.	Exam prerequisites: Participation in field work. Type of exam: Individual oral exam with an internal examiner. 20 min. Exam is without preparation based upon course assignments, handed in before deadline. Tools allowed: All tools are allowed. Re-exam: Equal to the ordinary exam.
Geothermal Systems (SE-STS1)	The student will gain knowledge about geothermal systems as a sustainable energy source and to obtain an understanding of the physical design, dimensions, functions and operation of these systems.	Exam prerequisites: None Type of exam: Individual oral exam, 20 min., based on one course assignment handed in before deadline. Internal assessment. Tools allowed: None. Re-exam: Equal to the ordinary exam.
Life Cycle Assessment (SE-LCA1)	In Autumn 2025: The purpose of this course is to: Equip students with in-depth knowledge of Circular Economy (CE) and its role in sustainable business development, while demonstrating how LCA serves as a fundamental tool in CE strategies. Provide students with a solid understanding of Life Cycle Assessment (LCA), including its principles, methodologies, and practical applications in engineering. Ensure that students can conduct and critically interpret LCA analyses of selected products and systems. Develop decision-making skills that integrate LCA results into	Exam prerequisites: None Exam type: Individual oral exam, 20 minutes. The exam is based on a randomly drawn topic with 20 min preparation time. Internal assessment. Tools allowed: All tools are allowed during preparation. Notes from preparation are allowed during exam. Re-exam: Conducted as the ordinary exam.

	sustainability assessments, regulatory compliance, and Circular Economy frameworks. Before Autumn 2025: Introduction to UNs Sustainable Development Goals, Circular Economy and LCA. Methods for Life Cycle Assessment (LCA) Impacts from use and reuse of resources and materials. Use of cases to evaluate alternative materials and technologies based on environmental and climate impact.	
Renewable Energy (ME-ENE1)	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	Exam prerequisites: Mandatory assignments. The assignments must be submitted by the deadline and be approved afterwards. Fail to meet the prerequisites will disqualify entering the examination. As of re-exam, a new set of assignment(s) and deadline will be set before the re-exam. Exam type: Oral Examination, 20 minutes. The oral exam will count 100% and divided into: a. Oral evaluation based on a mini project handed in before deadline (50%) b. Additional question from draws on the spot (50%) Internal assessment. Grade is on individual basis. Tools allowed: The submitted report of the mini project. Re-exam: Same as the ordinary exam. Case specific: A new set of assignment(s) and deadline might be set before the re-exam. The students might need to work on a new mini project, when necessary, improve the already submitted one or keep it without improvement.
Sludge Management (SE-SLM1)	To create an understanding of the sludge management techniques and their origin. Through information retrieval, discussions, presentations and laboratory exercises to provide the student with knowledge in and hands-on experience with current topics related to sludge management.	Exam prerequisites: None Type of exam: Ongoing tests in the form of four experimental reports and a final exam in the form of a presentation. All five are weighing equally. All reports must be handed in before deadline. Internal assessment Tools allowed: All tools allowed Re-exam: Equal to the ordinary exam. (Based on new assignments)
Toolbox Drinking Water (SE-TBD1)	Toolbox Drinking Water is a string of seminars on diversified drinking water related topics, that either digs a bit deeper in known areas, are new but important or are relevant for bachelor projects.	Exam prerequisites: None Type of exam: Individual oral exam, 20 min. with 30 min. preparation and based upon three course assignments and three presentations, handed in before deadline. Internal assessment. Tools allowed: Computer and notes allowed during preparation.

		Only new notes written during preparation allowed during exam. Re-exam: Equal to the ordinary exam.
Introduction to Machine Learning for Engineers (IT-MLE1)	This course introduces core methodologies in machine learning and AI, combining theory with hands-on applications. Students will be focusing on data preparation, and exploration before applying machine learning models for pattern recognition and prediction. The course emphasizes model selection, hyperparameter tuning, and performance evaluation using engineering-relevant metrics. A brief introduction to programming fundamentals, including loops and conditional statements, ensures all students can implement machine learning solutions effectively. Key Topics: - Elementary Python programming - Classification: Learning to categorize data into predefined classes. - Regression: Making accurate predictions of continuous outcomes based on input data. - Clustering: Unveiling hidden groupings in data. - Dimensionality Reduction: Simplifying high-dimensional data without significant loss of information.	Exam prerequisites: None Type of exam: The exam is a 20-minute oral examination that departs from one of the six assignments that the students made during the semester. The exam will also include a discussion of one of the other assignments. The assessment is based solely on the student's oral performance. Internal assessment. Tools allowed: None – however, students must bring their own laptop to the exam. Re-exam: Same as the ordinary exam.
Introduction to Programming for Engineers (IT-PRG1)	The long-term goal of this course is to provide participants with a solid understanding of the thinking and methods behind programming and IT technologies, often labelled “computational thinking". The short-term aim of the course is to enable the participant to use programming to solve a wide range of common place engineering task with special emphasis on data analysis. The course also gives the academic basis for studying Machine Learning and A.I. The course is aimed at people who have not previously worked with programming.	Exam prerequisites: At the end of the course, the student must upload a written summary of their 6 programming assignments that make up a portfolio of Python programs and of their group project, a total of 5 pages. The summary must include a brief reflection of the learning outcome of solving each of the assignments/group project and may include the docstrings that were written in the programs. Exam type: The exam is a 20-minute oral examination that departs from one of the six assignments that the student made during the semester. The exam will also include an examination of the group project assignment. All assignments and projects are programming assignments. The assessment is based solely on the student's oral performance. Internal assessment Tools allowed: All allowed for the project and the small assignments. At the exam, the student is expected to show their programs which means they must bring a working laptop that is able to display and run their code. Re-exam: If the portfolio or group project are deficient, the student(s) will have to make the necessary adjustments based on input from the teacher. An oral examination will then follow.

The learning objectives of the courses (knowledge, skills, and competencies) are further described in Appendix 1.

8 Workshops

Workshops are practice-related courses of one week's duration (outside of ECTS credits).
The courses are completed parallel to the 1st-4th semesters.

SE-PWS1	Company visits
SE-PWS2	QGIS
SE-PWS3	Welding
SE-PWS5	Water Sampling

9 Bachelor project

SE-BPR1
SE-BPR2

The programme concludes with a bachelor project (SE-BPR2), which accounts for 15 of the education programme's total 210 ECTS and concludes with an exam. The bachelor project commences in the 6th semester (SE-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.

BPR1 is expected to be approved before BPR2 begins.

The Bachelor project is prepared in groups of at least three persons, unless otherwise agreed with the head of programme.

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 exam/group test with individual assessment in accordance with the programme's overall goals as described in Section 1 of the Curriculum. The basis for exam 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.

Exams can take place at the earliest when all the other exams of the programme, including internships, have been passed.

See also section 7.1.

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 Climate and Supply Engineering.

For completed education programmes, VIA University College issues a diploma, specifying the title and, if applicable, special designation. Furthermore, information is provided on the scope of the sub-elements in ECTS, the result of the assessments achieved as well as the subjects of the project in the 6th semester and the bachelor project.

If the programme is withdrawn, VIA issues a certificate for the completed/passed courses.

The diploma is sent to the graduates e-Boks no later than 5 working days after graduation.

11 Appendix 1: Courses Climate and Supply Engineering Programme

updated before each new semester

Code	Title	ECTS-points	Knowledge	Skills	Competences
SE-BUD1	Basic Utility Design	5	Upon completion of the course, the students have gained knowledge of: - Components of drinking water and wastewater - Quality requirements for drinking water and wastewater discharge - Basic processes involved in drinking water and wastewater treatment	Upon completion of the course, the students will be able to: - Make basic analyses for drinking water and wastewater quality - Simple dimensioning of drinking water treatment - Calculation of drinking water consumption and wastewater produced - Present results for drinking water and wastewater quality	Upon completion of the course, the students will be able to apply knowledge and skills to: - At a basic level suggest a process design for drinking water and wastewater - Analyse demand and/or flows for a given area - Relate the demands for the quality to the existing legislations - Perform simple laboratory analyses - Describe the main components of each system
SE-CIA1	Climate Change, Impacts, and Adaptation	5	Upon completion of the course, the student has gained knowledge of: - Climate and weather systems - Climate change and impacts on society and the utilities sector - Climate change adaptation and mitigation - GIS platforms used for climate adaptation incl. their limitations - Screening and assessment of climate impacts - Climate adaptation strategy	Upon completion of the course, the student will be able to: - Identify and discuss the major causes of climate change - Propose suitable sustainable solutions for surface water management - Use various GIS tools for assessing flood or erosion risk - Gain an understanding of the intentions behind climate strategies	Upon completion of the course, the student will be able to apply knowledge and skills to: - Participate in discussions about climate adaptation projects at a qualified level - Assess and propose solutions for sustainable surface water management - Identify the different actors and responsibilities during the project process - Process/analyse climate challenges using GIS tools
SE-GEO1	Basic geology and Historical climate development	5	After the course, the student should have knowledge of: - The different types of the most common rocks and soils found in Denmark. - How the climate has changed over time and how it has shaped the Danish landscape. - That geology is variable (Geological profile) - Hydrogeology (water budget equation, infiltration, the different aquifers etc.) - That the Earth is one big system where everything is connected.	After the course, the student should be able to: - Recognize and describe the most common rock and soil types. - Relate the different rock and soil types to the Danish landscape and where they are typically found. - create a geological profile. - make an overall assessment of the hydrogeological properties of an area. - Overall assessment of an area's geological hazards.	After the course, the student should be able to: - Evaluate expected soil and groundwater conditions for a given site and assess their implications for a given area.
SE-GEO1 (from A25)	Basic geology and Historical climate development	5	After the course, the student should have knowledge of: - The main types and characteristics of the most common rocks and soils found in Denmark. - Past climate changes in Denmark and their influence on geological surface processes. - How different geological processes have shaped the Danish geology and landscape over time.	After completing the course, the student will be able to: - Identify and describe common soil types found in Denmark based on their physical characteristics in hand samples. - Describe key features of the geological and climate history of Denmark and the processes that have shaped the Danish landscape. - Explain the components of the water cycle and	After completing the course, the student will be able to: - Evaluate expected geological and hydrogeological conditions for a site and assess their implications for engineering purposes, including potential geohazards.

Code	Title	ECTS-points	Knowledge	Skills	Competences
			- Hydrogeology, and the water cycle, including the water budget equation, groundwater formation, and aquifers.	fundamental hydrogeological concepts (e.g. infiltration, aquifers, hydraulic conductivity, and the water budget equation). - Relate common soil types to their typical occurrence in Denmark and explain their formational environment. - Construct and interpret a simplified geological profile for a site based on soil descriptions	
SE-SCI1	Mathematical Analysis	5	The student will get knowledge about: - Differentiation - Trigonometric functions - Exponential functions - Integration - Vectors in space - Vector functions in space	After the completion of the course, the student will be able to: - Identify and make simple calculation on selected transcendental functions - Identify and make simple calculation on the branch of infinitesimal calculation, which deals with finding the derivative of functions with one variable, including different applications thereof - Identify and make simple calculation on the branch of infinitesimal calculation, which deals with integration of functions with one variable and different applications thereof - Analyse vectors and motion in space and perform calculations based on vector operations. IT is used in a pedagogical method in the course. The aim is that IT will support the learning process of the students and their understanding of the engineering professional possibilities in, for example, the application of modelling, simulation, etc.	After completing the course, the student can: - Perform a basic understanding for Calculus. - Use their acquired skills and knowledge to study more advanced Calculus and Algebra courses on their Engineering programme. - Use a commercial mathematical software to solve and perform serial technical calculations.
SE-SEP1	Semester project 1	10	The students must obtain an understanding of planning and design of sustainable systems and climate change adaptation in urban area. The students must gain basic knowledge in the processes for producing drinking water, treating wastewater and collecting rainwater.	Through the design of a sustainable urban supply structure, the student must become familiar with organisation/stakeholders basic understanding of the two utilities (and synergies) in terms of resource, production, processes (plant) and consumption/demand. Through completion of the project, group cooperation, report writing and presentation technique will be put into practice. PBL skills learning objectives: - Establish and contribute to a collaboration with the group and the supervisor - Apply covered theories on group dynamics, teamwork, and conflict resolution - Formulate and enforce a group contract with the group. - Identify relevant problems, formulate a problem statement, and explain proposed solutions.	At the end of the semester, the students must be able to: analyse and design supply systems for a small urban area using competencies, skills and knowledge obtained in the individual courses including - Applying sustainability as a concept. - Analyse and calculate demands for supply. - Identify resources for water supply. - Identify wastewater treatment solutions. - Identify climate challenges and design the rainwater management. - Include basic technical aspects. PBL competency learning objectives: - Apply and reflect on covered theories on learning and motivation. - Describe and reflect on the group's cooperation.

Code	Title	ECTS-points	Knowledge	Skills	Competences
				- Apply knowledge about references and source management. - Apply academic and technical writing style, report structure and rules for plagiarism. - Communicate the results of the project work in writing, graphically and orally to different target groups.	
SE-CPL1	Climate planning and the utility sector	5	Upon completion of the course, the student has gained basic knowledge of: - Municipal climate adaptation planning and strategies. - Various techniques in climate adaptation mapping. - Integration of climate adaptation principles into urban planning. - Urban infrastructure planning, including sewage systems. - Applying fundamental engineering methods for climate adaptation.	Upon completion of the course, the student will be able to: - Analyze plans and planning processes on a basic level. - Demonstrate the ability to use GIS for fundamental analysis. - Develop a comprehensible plan for rainwater disposal at the local level. - Articulate how the proposed solutions in the project can contribute to the UN Sustainable Development Goals. - Identify and address, in a foundational way, constraints imposed by the project area and relevant legislation and plans. - Able to provide reasoned arguments for chosen potential solutions in the planning of urban climate adaptation projects.	Upon completion of the course, the student will be able to apply knowledge and skills to: - Demonstrate the ability to effectively apply foundational and basic understanding of plans and planning processes in the urban climate adaptation projects. - Effectively put into action fundamental and basic analysis skills when using GIS for spatial analysis. - Leverage foundational and basic skills to construct clear plans for local rainwater disposal. - Basic knowledge to articulate how proposed solutions in projects can align with the UN Sustainable Development Goals. - Apply basic knowledge in the field of urban infrastructure planning, including sewage systems. - Presenting basic arguments for potential solutions in the planning of the urban climate adaptation projects.
SE-HYD1	Basic Hydraulics	5	After completion of the course, the student must have the knowledge of: - The physics of basic hydraulics - The design of rainwater and sewer systems. - The Mike Urban program	After completion of the course, the student must have the skills to: <u>Basic Hydraulics</u>: - Determine type of flow - Use energy equation - Calculate single and pipe losses - Calculate hydraulic and energy grade line - Use exponential and C&W's formula <u>Sewer systems</u>: - Calculate inlet for rainwater and wastewater pipelines - Design and dimension rainwater and wastewater pipelines - Perform back water calculations - Design basins <u>Mike Urban</u> - Create pipe systems and catchment areas - Create local CDS-rains with or without climate factor - Analyse pipe systems and basins with CDS-	After completion of this course, the student must have the competences to: - Understand hydraulic problems - Plan and dimension of Urban sewer systems - Calculate and analyse urban sewer systems in Mike Urban

Code	Title	ECTS-points	Knowledge	Skills	Competences
				rains - Present result as drawings and animations	
SE-INF1	Infrastructure	5	After completion of the course, the student must have the knowledge of: - Road types and planning - Traditional asphalt types and use of these in road constructions - Dimensioning of pipes for drinking water - Pump types - Pump dimensioning - Stormwater handling	After completion of the course, the student must have the skills to: - Perform analyses and road planning in rural areas - Determine design parameters for a road project - Propose relevant design of a cross section - Describe elements within a cross section, including drainage principles for roads in rural areas - Describe where pipes and cables are placed in a cross section - Dimension road pavement structures based on the catalogue method - Use MicroStation for geometrical design of a roads cross section - Setup and prepare road drawings for print - Dimension drinking water pipes - Select and dimension pumps - Determine network structure - Setup drawings (plans and longitudinal profiles) including pipes	After completion of this course, the student must have the competences to: - Determine a roads lay-out in regard to Danish Roads Standards and place pipes and cables in a road - Dimension utility pipes based on demand - Select pump type - Dimension the selected pump - Design optimal pipe network structure
SE-SCI2	Calculus, Linear Algebra and Dynamics	5	The student will get knowledge about: - Application of integration - Matrixes and matrix algebra - Linear equation systems - Polar coordinates - Complex numbers - Ordinary differential equations of the 1st and 2nd order - Physical quantities and units - Reference systems - Kinematics of particles - Kinetics of particles - Vehicle dynamics	After completing the course, the student will be able to: - Identify Area, Centroid and Moments of Inertia for a plane region in an x-y coordinate system. - Identify and solve Linear equations systems. - Identify Area, Centroid, Moments of Inertia for a plane region and length of a curve in a polar-coordinate system. - Make simple calculations on complex numbers. - Describe simple problems and solve Ordinary differential equations of the 1st and 2nd order - Identify kinematic relations in the description of motion particles in different reference systems. - Set up and perform serial calculations by using the Laws of Newton. - Analyse the motion of a vehicle treated a particle.	After completing the course, the student will be able to: - Identify which parts of the acquired knowledge and skills that's relevant to a given, simple mathematical or simple real-world particle dynamic problem. - Model simple real-world problems especially particle dynamics problems. - Use their acquired skills and knowledge to study more advanced Calculus, Algebra and Dynamics courses on the Engineering programme. - Use a commercial mathematical software to solve and perform serial technical calculations.
SE-SEP2	Semester project 2	10	The students must obtain an understanding of planning and design of sustainable infrastructural constructions and climate change adaptation in urban area. The students must gain basic knowledge in the processes for transporting drinking water, wastewater and rainwater. Furthermore, roads must be designed for the	The students must be able to design and dimension roads and pipe systems for drinking water and wastewater in the project area. The student must also be able to design and dimension installations for local rainwater handling.	The students will be able to: - Determine a road lay-out in regards to Danish Roads Standards and place utility pipes in a road and/or sidewalk - Dimension utility pipes based on demand - Select pump type if necessary - Dimension the selected pump if it is needed

Code	Title	ECTS-points	Knowledge	Skills	Competences
			area.	PBL skills Learning Objectives: - Be able to enforce and develop the group contract. - Can work based on the project group's own problem statement. - Apply covered theories on personal profiles and cross-cultural aspects in the group. - Apply knowledge about references and source management. - Apply academic and technical writing style, report structure and rules for plagiarism. - Communicate the results of the project work and learning process of the project group in a well-structured manner using technical terms in writing, graphically and orally.	- Design optimal pipe network structure PBL Competency Learning Objectives - Describe potential conflicts in the group and suggest solutions. - Define and reflect on own learning aims from the current and previous semester.
SE-BUD2	Water and wastewater processes and mass balances	5	Upon completion of the course, the student will have gained knowledge of: - Sources of raw water and quality of these sources - Principles of risk management in relation to drinking water quality - Treatment processes involved for drinking water and wastewater - The concept of water and mass balances in processes, which are key elements for understanding the behaviour of a treatment plant - Possible optimization methods for already existing treatment plants	Upon completion of the course, the student will be able to: - Perform a flow diagram with the water and mass balance - Construct process and instrumentation diagrams of existing and new treatment plants - Complete simple dimensioning of treatment plant - Analyze the actual data from the existing treatment plant - Calculate the quantity of different factors needed to perform the efficient treatment	Upon completion of the course, the student will be able to apply knowledge and skills to: - Propose a process design for drinking water and wastewater - Analyze treatment efficiency of existing treatment plant - Evaluate data from drinking water and wastewater treatment plant - Suggest the optimization possibilities for existing treatment plant
SE-CMI1	Water Quality - Chemistry and Microbiology	5	After completing the course, the student will be able to understand and use the following basic chemistry and microbiological terms and methods: - Describe and differentiate the different types of chemical bonds and intermolecular forces, give specific examples of chemical compounds for each type, and give specific examples on how these can influence the water quality and can be applied in the water treatment, including ion exchange, freezing point depressions. - Describe and differentiate various aspects of aqueous solutions relevant for water quality with respect to drinking water, wastewater, district heating and climate adaptation, including coagulation, flocculation, and chemical precipitation. - Explain chemical equilibrium and carry out calculations with the Law of Mass Action	After completing the course, the student will be able to: - Apply basic chemical and microbiological methods to address water quality issues related to processes of drinking water, wastewater, district heating and climate adaptations - Compare and evaluate water quality parameters for water samples - Evaluate the principles and application of various methods for chemical analyses of water samples (e.g., spectrophotometry, nepholometry, electrochemical methods) - Compare and evaluate the application of culture-based (e.g., HPC), enzymatic (e.g., ATP) and molecular biology (e.g. PCR) methods for water quality analysis - Describe growth optimum of microorganisms and understand the influence of environmental factors (e.g., temperature, pH and nutrients) on	None.

Code	Title	ECTS-points	Knowledge	Skills	Competences
			- Explain and describe acids, bases, and buffers and use the calculation of pH in aqueous solutions with relevance for water treatment and water quality - Describe basic chemistry of gas in water with relevance for the water treatment and water quality, including dissolved oxygen and oxygen demand - Calculate oxidation numbers and balance redox reactions with relevance for corrosion, water treatment and water quality. - Describe the structure of basic organic molecules including ATP and DNA - Describe the taxonomic classification system of microorganisms and name common bacteria - List different types of microorganisms and describe the general cell structure of bacteria and eukaryotes - Explain the bacterial growth phases and calculate bacterial growth rates - Explain AOC, BDOC, biological stability and after growth in relation to water quality - Describe the application of disinfection strategies for microorganisms (e.g., heat, chlorination, UV) - Describe the most important microbiological processes in drinking water and wastewater treatment (nitrification, denitrification, degradation of organic matter, etc.) and give examples of the involved bacteria - Describe the structure, development, and function of biofilms in water systems	microbial growth - Contrast beneficial, pathogenic and indicator organisms and give examples of microorganisms in each group in water systems - Compare planktonic and sessile mode of growth and discuss the advantages for microorganisms of living in a biofilm	
SE-CMI1 (from A25)	Water Quality – Chemistry and Microbiology	5	After completing the course, the student will be able to understand and use the following basic chemistry and microbiological terms and methods: K1: Write math equations for the following physical and chemical laws: Dalton's, Boyle's, Charles's, Ideal Gas, Henry's, Conservation of Mass, Mass Action, Stokes', Beer's. K2: List the 8 main ions in natural water showing formula, charge and formula weight. K3: Define key water chemistry concepts and terms such as: dynamic equilibrium, mole, suspension, Calcium Carbonate Precipitation Potential (CCPP), acid/base reactions, redox reactions, water types.	After completing the course, the student will be able to: S1: Perform calculations in connection with the physical and chemical laws, using the unit analysis method. S2: Perform equilibrium calculations using the Law of Mass Action S3: Determine oxidation numbers in compounds and balance redox equations. S4: Use the PHREEQC program to calculate speciation, saturation index and ion balance. S5: Perform calculations and construct graphs to determine reaction order and reaction rates. S6: Describe the phases of bacterial growth in batch cultures (lag, exponential, stationary, and	After completing the course, the student will be able to: C1: Discuss characteristics which distinguish solutions, colloid suspensions and non-colloid suspensions from each other. C2: Assess the characteristics of various water parameters and design sampling methods that are appropriate for the parameters. C3: Classify chemical equations as acid/base, redox, both or neither. C4: Interpret results from a chemical analysis package to determine groundwater processes in an aquifer. C5: Explain water processes such as aeration, precipitation, sedimentation, disinfection, ion

Code	Title	ECTS-points	Knowledge	Skills	Competences
			K4: List Danish Quality Criteria for drinking water (nitrate, arsenic, iron, manganese & ammonium) and for wastewater (nitrogen, phosphorous, theoretical oxygen demand). K5: List and distinguish between major groups of microorganisms (bacteria, archaea, protozoa, etc.). K6: Identify and classify microorganisms relevant to water systems across taxonomic ranks, from domain to species level (e.g., Bacteria → Proteobacteria → Enterobacteriaceae → Escherichia → E. coli). K7: Define key concepts related to organic carbon and microbial regrowth in water systems, including Assimilable Organic Carbon (AOC), Biodegradable Dissolved Organic Carbon (BDOC), biological stability, and aftergrowth, and their relevance to water quality. K8: Provide examples of key microbial groups involved in biological processes in water systems (ammonium oxidizing bacteria (AOB), nitrite-oxidizing bacteria (NOB), Nitrospira, Anammox bacteria, Legionella, heterotrophic bacteria, anaerobes, etc.)	death) and calculate key growth parameters such as generation time. S7: Describe and evaluate the strengths and limitations of various disinfection methods to control and eliminate microorganisms in water systems, including chemical (e.g., chlorination, ozonation) and physical (e.g., UV irradiation, filtration) methods. S8: Describe the formation, structural organization, and functional roles of biofilms in water systems, including their impact on microbial persistence, water quality, infrastructure, and treatment processes. S9: Apply Michaelis-Menten equations to analyze enzyme-catalyzed reactions, and calculate kinetic parameters from experimental data using graphical methods (e.g., Lineweaver-Burk plots)	exchange, and pyrite oxidation. C6: Compare and contrast the principles behind spectrophotometry and nephelometry. C7: Critically assess the principles, applications, and limitations of culture-based (e.g., HPC), enzymatic (e.g., ATP), and molecular biology (e.g., PCR) methods used in water quality analysis. C8: Differentiate between beneficial, pathogenic, and indicator microorganisms, and evaluate their roles in water systems.
SE-HYD2	Hydraulics 2	5	Construction of model of pipe network, which integrates fjord, stream and city. Address and control climate-based water level rises by introducing pumps and flood gates. Construction of a model of pipelines in a pressurized system. Energy savings through pressure zones, use of elevated storage tanks and pumping strategy	To be able to build Mike Urban models with boundary conditions and control of flood gates and pumping stations. Understanding of the connection between water level in recipients and control and regulation strategy. To be able to build and calibrate EPA network models. Understanding the connection between operating strategy and energy consumption.	Use Mike Urban to analyse correlations between urban drainage, flow in watercourses, and water level variations in coastal recipients. Carry out long-term simulations with LTS-module. Analyse existing systems and make suggestions for the implementation of gates and pumps - and set up a management strategy. Use EPA net to analyse pipe networks and on that basis make proposals for division into pressure zones, as well as restructuring in order to facilitate monitoring and leak detection. Make suggestions for operational optimization based on analyses of existing systems.
SE-TMP1	Thermodynamics, Process Engineering and District Heating	5	The students gain knowledge about: - Principles of processes and specific unit operations, as well as instrumentation and components. - Basic thermodynamics, including the 0th and 1st law, energy balance of open and closed systems, equation of state and changes of state of ideal gases, thermodynamic cycle processes, the 2nd law and entropy of thermodynamics and real substances.	After completion of the course, the student will be able to: - Prepare block flow diagrams and pipe and instrumentation diagrams (P&ID) for an existing plant. - Outline and calculate energy balances for thermodynamic processes and systems. - Make basic calculations of thermodynamic systems, including heat exchangers, steam power plants and heat pumps.	After completion of the course, the student will be able to: - Identify which parts of the acquired knowledge and skills are relevant to a given thermodynamic problem in a district heating system. - Relate the acquired knowledge and skills to creating simple mathematical models of real thermodynamic problems. - Analyse thermodynamic processes in a district heating system and suggest potential optimisation

Code	Title	ECTS-points	Knowledge	Skills	Competences
			- District heating system processes: Heat transmission/heat exchangers, pumps, steam power plants as well as refrigeration systems and heat pumps.	- Model a simple district heating system in Leanheat® Network software.	opportunities. - Communicate about processes, thermodynamics and district heating using professional terms
SE-SEP3	Semester Project 3	10	The student will get knowledge on how to: - Describe the major subjects in process engineering - Identify various units or processes of a supply plant - Describe the function of each unit	After completing the course, the student will be able to: - Illustrate a supply plant by construction of a simple Process and Instrumentation Diagram (P&ID) - Demonstrate material/energy balances for the overall process and for one or more specific compounds - Make a flow diagram for a supply plant - Calculate retention time - Present names of microorganisms using correct nomenclature - Describe beneficial or harmful effects of one or more groups of microorganisms - Present chemical reactions with correct notification - Setup chemical reactions for one or more relevant processes - Evaluate if a given process meets quality requirements for one or more parameters - Describe instrumentation and components relevant for the supply plant - Plan, write and review a Project Report and a Process Report - Prepare and carry out an oral presentation - Enter into a respectful dialogue and collaborate with companies for the benefit of both parties. PBL Skills Learning Objectives: - Can search, find, and include relevant knowledge. - Can apply academic and technical writing, report structure and rules of plagiarism. - Can communicate the results of the project work and the project group's learning process in a structured way using professional concepts, both written, graphical, and oral.	After completing the course, the student will be able to: - Analyse units or processes of a supply plant - Suggest potential process optimizations PBL competency Learning Objectives: - Can structure and adapt group collaboration to the preferences and competencies of the members. - Can receive and reflect on guidance and facilitation of group collaboration. - Is capable of independently planning, structuring, and optimizing own learning process based on previous experiences. - Can argue for the choice of sources, methods, and solutions based on a critical assessment. - Can incorporate a holistic and sustainable approach to the project with an eye for connections to the surrounding world.
SE-VVM1	Environmental Assessment	5	Students completing this course will be familiar with: - How to find and read legislation on Environmental Impact Assessment (EIA) - How to identify projects which require Environmental Impact Assessment (EIA)	Students completing this course will be able to: - Identify if a project belongs to appendix I or II of EIA directive - Identify typical conflicts of interest in the natural and environmental management - Identify and apply the methods and data used	After completion of the course the student must be able to: - Carry out an EIA screening for projects relevant to supply engineering - Be able to visualize geodata in maps intended for project communication

Code	Title	ECTS-points	Knowledge	Skills	Competences
			- The overall processes of an Environmental Impact Assessment (EIA) - The process and questions relevant to an Environmental Impact Assessment (EIA) screening. - How to find typical areal conflicts of interest in the natural and environmental management - The most common used public webservices distributing geodata - The basics of permit applications for projects, including types of permits (e.g., excavation, construction, utility installation) and basic requirements. - The components of a permit application and the practical knowledge required for supply engineering projects.	for EIA screening of different types of projects - Describe the use of significance arguments with respect to an EIA screening - Identify cross-links and remediation topics in the relation between project planning and EIA - Name the Competent Authority with respect to EIA relevant for a specific project - Extract relevant geodata from public webservices and import these into QGIS - Create a WebGIS to visualize the project results - Explain the basics of permit applications for projects, including various types of permits (e.g., excavation, construction, utility installation) and the basic requirements and components of a permit application. - Prepare a comprehensive permit application for a hypothetical project.	- Identify and describe different types of permits (e.g., excavation, construction, utility installation) and outline the basic requirements and components of a permit application. - Create a thorough permit application for a hypothetical project
SE-MSC1	Material Science and Corrosion	5	After completion of the course the student must be able to: - Demonstrate basic knowledge about metals and polymers - Apply standard test methods - Explain deformation, stresses, and fracture in tension-loaded materials - Be familiar with the topics Corrosion Management and Failure Analysis	After completion of the course the student must be able to: - Select a suitable material for the manufacture of components in the supply industry - Carry out common test methods for materials - Explain the relation between deformation, stresses and fracture in tension-loaded materials - Explain relevant degradation mechanisms of materials specific to the supply industry - Carry out corrosion investigation of selected materials/components from the supply industry	After completion of the course the student must be able to: - Participate in development tasks covering the design and/or evaluation and improvement of components for the supply industry - Combine data from various sources for developing an improved corrosion management strategy - Analysed corrosion failures and link to corrosion industry standards
SE-TMP2	Environmental Data & Python programming	5	After successful completion of the course, the student will be able to: - Describe concrete examples of typical data sources in climate and supply applications ranging from discrete sampling events to continuous logging. - Define digital transformation, front end, back end and typical database terms such as record, field, relationship, query, primary and foreign keys. - Use a Python programming environment such as Visual Studio Code together with its debugger - Write Python syntax including wrapping code in functions and using libraries - Methodes and strategies for data management in the utilities sectors.	After successful completion of the course, the student will be able to: - Construct a simple normalized data model that conforms to the first, second and third normal forms of database design. - Explain and exemplify the most used data structures (List & Dictionary) and to identify when to use them - Extract data from data sources used throughout the course - Construct plots using Python libraries after filtering the data	After successful completion of the course, the student will be able to: - Assess data quality based on quality characteristics/dimensions including accuracy, completeness, consistency, and relevance. - Filter and analyse data using Python - Design a solution for a data driven problem - Discuss and explain the chosen solution - Discuss applied examples of data utilization and digital transformation in the climate and utilities sector - Analyse cases on data management in the utility sector including censors, sources, ethics and governance

Code	Title	ECTS-points	Knowledge	Skills	Competences
SE-SUD1	Sustainable Drainage	5	The purpose of the course is to provide the students with knowledge on how to implement sustainable solutions to handle an increase in rain/raise of sea water in urban areas.	After the completion of the course the student must have knowledge about: • Climate change, precipitation, sea water level. • Methods to handle rainwater locally. • Reuse of rainwater. • Green roofs. • Infiltration basins. • Cctv and No-Dig repair of pipelines. • Open channels • Use of Scalgo	The student will be able to communicate with students, engineers and companies about sustainable drainage and outline proposals for projects involving new and sustainable methods of handling rainwater. The student will be able to use Scalgo and Mike Urban to design overland structures for the handling of stormwater.
SE-SEP4	Semester Project 4	10	The student is expected to achieve an understanding of other engineering capabilities during the completion of the project. The student must gain an understanding of the connection with water management both upstream and downstream of the project area The student must achieve knowledge and skills to plan and design renovation of infrastructure in urban areas.	The student should gain skills to: - Use digital collaboration platform - Demonstrate an understanding of the complexity of an infrastructure project - Demonstrate the ability to communicate the project result to the client - Analyze and use data - Understand different forms of communication and be able to act accordingly. - Explain ethical considerations in the project work - Reflect on knowledge sharing in the project group and the quality of the project work - Apply academic and technical writing style, report structure, and rules for plagiarism.	At the end of the semester, the student must have acquired competencies to: - Use digital collaboration platform - Demonstrate an understanding of the complexity of an infrastructure project - Demonstrate the ability to communicate the project result to the client - Analyze and use data - Plan, structure and carry out effective interdisciplinary collaboration. - Reflect on knowledge sharing in the project group and with other groups. - Communicate and argue for the results of the project work and the project group's learning process in a structured way using academic concepts, both written, graphic and oral. - Argue for the choice of sources, methods and solutions based on a critical assessment. - Explain ethical considerations in the project work.
SE-INP1	Engineering Internship (SE-)	30	The student must • gain knowledge of the theory, methods and practices of a profession or one or more fields of study • be able to understand the transfer of theories and methodology into practice • be aware of the ethical, societal, health-and-safety, environmental, economic and industry-related implications of engineering practices.	The student must be able to: • apply the methods and tools of one or more fields of study in professional practice • assess theoretical and practical problems and to substantiate and select relevant solutions • reflect on the relationship between theories, methods and practices • communicate effectively with professional peers as well as with professionals with other educational, language and cultural backgrounds	The student must be able to: • handle complex and development-oriented situations in a study or work context • independently participate in professional and interdisciplinary collaboration with a professional approach • identify own learning needs and organise own learning processes in various learning environments • develop the personal skills required for the professional career as an engineer • form the basis for developing personal/professional networks.

Code	Title	ECTS-points	Knowledge	Skills	Competences
SE-TEN1	Tendering and Contracting	5	Students will gain a comprehensive understanding of: - the unique demands and legal requirements for procurement - how to align tendering processes with sustainability and climate adaptation goals - contractual relationships and organizational models specific to utility projects - principles of risk and process management within procurement frameworks.	Upon completion, students will be able to: - prepare and critically evaluate tender documents - apply Danish and EU procurement laws to practical tendering scenarios - design and implement procurement strategies suited to sustainable infrastructure projects - perform award evaluations and communicate effectively with stakeholders. - manage risks and processes during the tendering and contracting phases	Students will develop the ability to: - collaborate effectively with stakeholders across public and private sectors - navigate complex procurement procedures and contribute to sustainable project outcomes - analyse and select appropriate contractual and organizational models.
SE-BPR1	Bachelor Project Preparation course	5	At the successful completion of the course, students will be able to: - Recognize forms of bias. - Distinguish between primary and secondary research	At the successful completion of the course, students will be able to: - Identify a good project topic in a systematic way. - Create and execute search strategies to find relevant literature. - Construct an experimental design for the coming project. - Preparation and delivery of oral presentations. - Write a Project Description following the VIA Engineering guidelines including the following parts: 1. Background description, 2. Definition of purpose, 3. Problem statement, 4. Delimitation, 5. Choice of models and methods (experimental design), 6. Time schedule, 7. Risk assessment and 8. Sources of information (reference list). - Prioritize, choose, and justify the selection of solution models for complex issues, including reflecting on the choice of scientific method. - Argue for the selection of sources, references, and data in connection with project work.	At the successful completion of the course, students will be able to: - Communicate with an external partner. - Extract the essence of a project and defend this clearly through oral presentation. - Make effective use of feedback/feedforward from a supervisor. - Work together in the project group as a team. - Independently and critically analyze new knowledge and argue for its application related to the project work. - Work analytically, methodically, and systematically on the semester project within the project group and incorporate ethical considerations within the profession.
ENG-IDE1	Innovation and Entrepreneurship project	10	After having successfully completed the course, the students will have gained: - An understanding of innovation and entrepreneurship and its uses within the field of engineering and business. - Knowledge about three different innovation processes Design Thinking, Effectuation and Lean Startup - Knowledge about how to create a systematic and measurable progress in innovation and entrepreneurship tasks	After having successfully completed the course, the students will be able to: - Engage in innovative and entrepreneurial processes in a cross-discipline setting - Conceive, plan, and execute innovative ideas - Work methodically with innovation and entrepreneurship - Collect and apply relevant data/information about technologies, markets, and end users - Apply method to gain insights about the solutions impact on the current market. - Convey and argue for the results of a cross-disciplinary project group and the project group's learning process using correct professional terminology and optimal tools both in writing, graphically and orally.	After having successfully completed the course, the students will have gained competences in: - Introducing innovative ideas into project work - Contributing own professional skills in multidisciplinary teams with the objective of solving problems by using innovative and entrepreneurial processes and models - Clarifying multidisciplinary group competencies - Analyzing group dynamics and adapting working methods and collaboration methods to new group constellations to achieve effective collaboration in cross-disciplinary project teams - Independently structuring and planning own learning process in an interdisciplinary learning environment Able to independently argue for the application and implementation of valid

Code	Title	ECTS-points	Knowledge	Skills	Competences
					knowledge
SE-BPR2	Bachelor Project	15	After the completion of the project work, the student must be able to: - Describe a given (chosen) engineering problem, list relevant tools (formulas, methods, software, etc.) to clarify the problem, apply the tools, reflect and conclude. - Understand how the conclusion/solution to the given problem influences connected areas theoretically and/or technically.	After the completion of the project work, the student must be able to: - Apply engineering theories and methods within chosen subjects and independently be able to plan and carry out experiments or practical measurements as appropriate. - Acquire new knowledge critically within relevant engineering fields. - Apply quality assurance/critically review data and results. - If relevant, make financial estimates for the project/solution. - Present all relevant information in report and appendix, using references and sources of information correctly. - Extract the essence of the project and communicate this clearly orally and in writing.	After the completion of the project work, the student must be able to: - Analyse a given (chosen) problem, collect data, select appropriate methods of analysis, put the results into perspective and conclude. - Plan and carry out the project and related activities according to self-defined time schedule.
SE-ADW1	Applied Drinking Water Quality	5	- Understand principles of drinking water sampling - Understand basic laboratory analyses for drinking water (physical, chemical and microbiological) - Have knowledge of drinking water quality criteria (Danish/European drinking water legislation, and supplemental parameters) - Describe aspects of deterioration of drinking water quality (physical, chemical and microbiological) - Explain causes of different contamination scenarios - Understand the use of extended water treatment methods	- Collect samples for analysis of drinking water quality (water, backwash water and/or filter medium) - Practice basic laboratory methods and equipment (pipettes, scales, dilution, calibration, safety) - Perform laboratory analyses for documentation of drinking water quality (physical, chemical and microbiological parameters) - Obtain and evaluate empirical data from laboratory experiments - Report results from laboratory analyses in text, figures and tables - Compare and evaluate the application of physical, chemical and microbiological drinking water analyses	- Analyse results of laboratory experiments, discuss the results and relate the results to the scientific papers and other literature - Analyse a situation with undesirable drinking water quality including: How to collect data and select the appropriate analyses. How to cope with the consumers and the legislation, etc.
SE-AWT1	Advanced Water Treatment	5	After completing this course, the student will be able to: Account for types of advanced water treatment methods with a more in-depth knowledge of the treatment methods selected in the course. Identify problematic water quality parameters (physical, chemical and microbiological) in a water resource according to the Danish/European legislation Describe causes of problematic water quality and/or water contamination scenarios	After completing this course, the student will be able to: Analyse data from a water resource and identify potential water treatment methods Argue pros and cons of the in course selected advanced water treatment methods Execute laboratory experiments and analyse selected water quality parameters Retrieve and present relevant information of a selected advanced water treatment method or topics related to drinking water quality Extract and evaluate data of drinking water analysis from the Jupiter database	After completing this course, the student will be able to: Design laboratory experiments to analyse the applicability of a proposed water treatment method Analyse, interpret and present data acquired during laboratory experiments and/or field tests Design methods for advanced drinking water treatment for a given water type based on e.g. chemical composition and challenges.

Code	Title	ECTS-points	Knowledge	Skills	Competences
SE-AWW1	Applied Wastewater Quality	5	- Usage and application of basic laboratory equipment - Possible methods for characterization of wastewater quality and their application - Sampling and analytical techniques methods - Composition of wastewater and its significance in wastewater treatment - Recognition of wastewater properties in assignation for different wastewater treatment methods - Ability to find the dependency between tested parameters - Basic characteristics of different treatment methods considering selected technologies	- Calibration methods of electrodes and pipettes - Advanced application of Hach-Lange cuvettes for indication of different parameters in wastewater quality - Calculation of dilution factors and concentration levels for different samples and chemicals - Standards for wastewater characterization - Analytical methods in indication of wastewater properties - Principles and application of characterization methods - Reading of the wastewater discharge quality reports for different industries	- Analyse a situation with undesirable wastewater discharge quality or improving existing method for control and treatment, including: How to collect data and select the appropriate analyses, How to cope with the consumers and the legislation, etc. - Indicate wastewater streams for different industries and its production lines - Characterize wastewater samples with respect to physical, chemical and microbiological parameters - Obtain and evaluate empirical data from laboratory experiments - Report results from laboratory analyses - Compare and evaluate the application of physical, chemical and microbiological wastewater analyses - Assign wastewater stream to a given wastewater treatment method
SE-DSD1	Design & Simulation of District Heating System	5	Know the design and structure for energy storage and carry out energy balance for the system. Calculate main dimensions, capacities and losses for storage of thermal energy. Make energy analysis and calculate temperature changes for non-stationary heat flow processes. Carry out computer simulations for changes in different energy systems like storage charging and discharging, mixing of flows, changing of thermodynamic cycle and optimize energy streams.	The student will be able to analyse the correlation between energy consumption, storage and production and to evaluate storage solutions, calculate storage capacities and carry out software simulations for renewable and industrial thermal energy systems.	The course will give the student competences in designing a thermal solar system including short term and seasonal storage. Furthermore, the student will be able to communicate and collaborate with energy engineers about storage and operation of energy systems.
SE-DWT1	Design of Wastewater Treatment Plant	5	- Knowledge of designing basic treatment facilities in order to remove grease and oil, sand and gravel, suspended solids, organic matter and ammonia. - Establishing of a simple flow diagram and understanding of the internal relations between functions. - Knowledge of hydraulic demands within the individual cleaning functions as well as the whole plant. - Composition of wastewater and its significance in wastewater treatment. - Recognition of wastewater cleaning methods related to the different wastewater treatment methods. - Ability to find the right design of WWTP according to the actual outlet demands.	- Able to design a mechanical – chemical and biological WWTP - Dimensioning of the screens - Volume calculation of sand and grease trap - Volume calculation of primary settlement tank - Volume calculation of biological tank with nitrification, denitrification and phosphorus removal - Volume calculation of secondary settlement tank - Estimation of oxygen demands	- Comparing different treatment systems and able to choose the right one for the actual case. - Characterize different treatment methods with respect to physical, chemical and microbiological parameters. - Use optimal hydraulic design in order to avoid unwanted settlement within the system. - Analyze a specific wastewater flow and outlet demands in order to establish the necessary treatment plant. - Explain the design criteria from an environmental point of view, create a flow diagram, and plan drawing of the WWTP according to this. - Analyze a situation with inefficient treatment and find a way of improving this using learned treatment methods and skills.

Code	Title	ECTS-points	Knowledge	Skills	Competences
			- Possible cleaning achievement from the different treatment methods and systems. - The impact on the biological process from outside factors.		
SE-DWT2	Design of Wastewater Treatment 2	5	- Concepts and assessment methods involved in providing basic understanding of activated sludge process and the possibility of achieving biological cleaning of wastewater. - Digital models used for wastewater treatment plant design. - Usage of WEST – modelling program used for design and evaluation of wastewater treatment. - Usage and application of design models and constructions. - Ability to find needed constructions and process to create the wanted level of treatment.	- Able to create a digital wastewater treatment plant model. - Analytical methods in identifying needed treatment of the wastewater. - Principles and application of advanced as well as simple treatment methods. - Analyze the performance of created model and evaluate on the results.	- Characterize different treatment methods with respect to physical, chemical and microbiological parameters. - Evaluate wastewater data and from this being able to design digital model for treatment. - Present digital results in a clear and simplified way. - Analyze a situation with inefficient treatment and find a way of improving this using learned treatment methods and skills.
SE-GPT1	Geophysics and Pump Test	5	By the end of the course the student must be able to - design a well site and suggest relevant geophysical pre-investigations. - plan and interpret well tests. - estimate the long-term drawdown and evaluate the risk of contamination of the aquifer.	After completion of the course, the student must - Be able to analyse and calculate flow and pressure variations for simple groundwater models. - Be able from the target and expected geophysical properties of soils or rock in an area to suggest geo-physical method and strategy for mapping of relevance to ground water mapping. - Have acquired knowledge on geoelectrical and electromagnetic geophysical methods, their principles and applications. Be able to discuss results and uncertainties. - Have acquired basic knowledge of other geophysical methods. Be able to list alternatives to geoelectrical and electromagnetic methods and their application. - Be capable of planning and interpreting well test analysis for a specific problem. - Be able to discuss what to focus on in risk assessments related to ground water extraction. - Be able to estimate the long-term influence of ground water extraction e.g. changing flow directions, effect on surface waters, salt water intrusion and mobility of contamination. - Be aware of water balances and parameters to evaluate for planning of sustainable water extraction.	The student will be able to occupy a position in a utility, municipality or engineering company where the cur-rent course will give them capabilities on a general level to plan investigations of possible source locations and/or to make a quality assessment of a suggested survey.
SE-LCA1	Circular Economy and LCA	5	Students completing this course will be familiar with: - The role of LCA and Circular Economy in global and national sustainability initiatives, including	Students completing this course will be able to: - Apply and explain methods within the circular economy, such as the R-hierarchy. - Apply LCA methodologies to analyze	Students completing this course will be able to: - Define comparable scenarios for competing products or systems, such as supply facilities, buildings, and infrastructures, to analyze their

Code	Title	ECTS-points	Knowledge	Skills	Competences
			Planetary Boundaries, Absolute Environmental Sustainability Assessment (AESA), the UN SDGs, Sustainability Certifications, and the EU Taxonomy. - International and national frameworks for LCA analyses (ISO standards). - Step-by-step methodology for conducting an LCA analysis. - Methods for defining functional units, system boundaries, and timeframes in LCA analyses. - Selected data sources for Life Cycle Inventory (LCI), Life Cycle Impact Assessment (LCIA), and Environmental Product Declarations (EPD). - Various environmental impact categories.	environmental impacts of products, buildings, and infrastructure projects. - Identify barriers and develop strategies for advancing the circular economy. - Define functional units, system boundaries, and timeframes for LCA analyses in accordance with relevant guidelines. - Conduct LCA analyses for simple product- or system-scenarios following established guidelines. - Compare, interpret, and present LCA analysis results, and discuss their implications for decision-making. - Utilize Environmental Product Declarations (EPDs) to perform LCA analyses using relevant calculation tools (e.g., variant analysis). - Evaluate case studies in relation to circular economy principles and LCA compliance.	respective environmental impacts. - Relate the results of LCA analyses to circular economy principles to propose sustainable choices in specific contexts.
SE-SLM1	Sludge Management	5	Concepts and assessment methods involved in providing basic understanding of sludge management techniques and their application in relation to kind of sludge and its origin Usage and application of basic laboratory equipment. Possible methods for characterization of sludge quality and their application. Ability to find dependency between analytical results (sludge composition) and sludge management techniques. Quality criteria definitions for possible management technique	Standards for sludge characterization. Analytical methods in indication of sludge properties. Principles and application of characterization methods. Sludge management techniques for different kinds and origins of the sludge. Quality criteria (Danish/ European regulations and legislations)Experimental reports and literature retrieval related to sludge management techniques	Characterize different sludge sources with respect to physical, chemical and microbiological parameters. Obtain and evaluate empirical data from laboratory experiments. Report results from laboratory analyses. Create, compare and evaluate the feasibility of different sludge management techniques based on sludge origin. Analyse a situation with inefficient sludge management technique and find way of improving existing management method, including how to collect data and select the appropriate analyses, etc.
SE-STS1	Geothermal Systems	5	The student will gain knowledge about geothermal systems as a sustainable energy source and to obtain an understanding of the physical design, dimensions, functions and operation of these systems.	After the completion of the course, the student must be able to: - Describe the thermal properties of rock and soil. - Explain the working principle of a heat pump. - Calculate thermal conductivity from thermal response test data. - Dimension a geothermal system using the professional software EED. - Calculate COP for a heat pump by measuring produced and spent energy in a system. - Describe the construction of a borehole heat exchanger and identify critical areas. - Identify the various conflicts of interest in relation to ground source heating and cooling.	
SE-TBD1	Tool Box Drinking Water	5	At the successful completion of the course, the student will be able to…	At the successful completion of the course, the student will be able to…	At the successful completion of the course, the student will be able to…

Code	Title	ECTS-points	Knowledge	Skills	Competences
			- Describe the typical structure of a peer-reviewed paper. - Describe complex drinking water treatment technologies. - Describe a variety of data metrics used in drinking water treatment.	- Review scientific papers in a critical manner. - Perform literature searches to identify supplemental references. - Analyse and compile information from different sources and potentially opposing views on a topic. - Present a structured summary of a given topic in class using oral and visual techniques. - Argue the pros and cons of the presented topic.	- Apply critical thinking to scientific papers, reports, legislation. - Evaluate implications of applying a given technology, law or approach in a given situation. - Compare different technologies, policies etc., in different settings.
ME-DES1	Design of Energy Systems	5	The student will acquire knowledge in, * Refrigeration plants * Heat pumps * Refrigerants * Energy efficiency and impact on the environment * Cooling load * Air conditioning processes	The student will be able to analyse the thermal load for an energy plant and on this basis combine process theory and common dimensioning practice to design an energy efficient cooling plant or heat pump with low environmental impact.	The student will obtain competences to communicate about designs of different types of energy plants. Furthermore, the student will be able to design simple energy plants in a methodical way and more complex systems in co-operation with energy engineers.
ME-ENE1	Renewable energy	5	The student will acquire knowledge in, – Energy savings – Thermal solar heating and simulating of energy storage systems using TRNSYS 17 – Other thermal energy system (Packed-bed storage, storage wall and phase change energy storage) – Biomass and biogas – District heating and district heating network – Geothermal energy Renewable energy management (e.g. tax structures, costs for energy production, cost analyses, environmental issues)	Analyse the consumption of town or building and evaluate possible energy savings. Calculate the energy production from renewable sources with the integration of various energy storage scenarios. Calculate the eventually needs for supplementary fossil fuel production and the saving of CO2 emission.	The student will be able to communicate with students, engineers and companies about renewable energy and outline proposals for renewable energy supply.
IT-MLE1	Machine Learning for Engineers	5	By the end of the course, students will have in-depth knowledge of key machine learning algorithms, methodologies, tools, and applications, including: - Data Preparation & Preprocessing: Handling missing data, normalization, and feature engineering. - Classification Algorithms: Naïve Bayes, k-Nearest Neighbor, Decision Trees, Logistic Regression, Neural Networks. - Regression Techniques: Simple linear regression, multiple linear regression, Ridge and Lasso regression. - Dimensionality Reduction Algorithms: Principal component analysis - Clustering Methods: k-Means, Agglomerative Clustering	Upon completion, students will have developed: - The ability to preprocess data and prepare it for machine learning tasks. - Proficiency in implementing and fine-tuning classification models using real-world datasets. - Skills to apply and interpret regression models to predict continuous variables. - The capability to reduce the dimensionality of datasets while preserving important information. - Competence in clustering unlabelled data and determining optimal cluster numbers. - Expertise in using leading machine learning tools (e.g., Scikit-Learn, Keras, TensorFlow). - The ability to critically assess and improve model performance using various validation techniques.	Upon successful completion of the course, students will: - Use simple Python scripts to solve machine learning problems - Tune machine learning algorithms to optimize performance for unique datasets. - Design and implement machine learning systems to solve complex real-world problems. - Communicate and justify machine learning solutions and decisions to both technical and non-technical stakeholders.

Code	Title	ECTS-points	Knowledge	Skills	Competences
			- Model Evaluation Metrics: Accuracy, precision, recall, F1-score, MSE, cross-validation.		
IT-PRG1	Introduction to Programming for Engineers	5	Account for the following basic programming concepts: - data types - operators - variables - control structure - conditions - loops - functions - recursion - exceptions - inheritance Demonstrate knowledge about the following basic algorithmic techniques: - Sorting - binary search Additionally, the student will be able choose an appropriate method for - file-based input/output - testing and debugging	- Use basic programming concepts and simple algorithmic techniques - Prepare an engineering problem into sequences that can be transferred to code - Prepare simple programs and applications that can automate engineering tasks - Use standard libraries for engineering purposes	- Create well-structured programs and perform testing of these - Create programs and scripts for solving engineering problems