Unfold your talent
VIA University College

Curriculum

Programme section

Bachelor of Engineering, Civil Engineering

Valid from August 2017 (intake up to and including August 2020)
- Updated August 2021

Updates August 2022:
- CE-BPR1, content and assessment
- Electives and conditions for obtaining speciality designation

Updates August 2023:
- clarification of exam prerequisites, 7th semester (autumn 2023)
- change of prerequisite for obtaining the specialisation designation Infrastructure

INDHOLD

Date: 4. July 2017

Update: September 2019

Update: August 2021

Update: August 2022

Introduction

In accordance with the Diploma Engineering Education programme, the purpose of the diploma-engineering programme is to qualify students to, nationally and internationally, carry out the following business functions:

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

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

VIA Engineering endeavours to work in accordance with a common DNA for all engineering courses. The DNA contains a description of what especially characterizes the engineering programmes at VIA, as well as what to expect from a graduate from our engineering programmes.

At VIA Engineering, we are practice- and project oriented and focused on the surrounding world. These goals are achieved in the form of qualified graduates obtained through targeted education, relevant research and development as well as cooperation and ongoing dialogue with the business community. The programmes at VIA Engineering will qualify the graduates to perform practice- and development-oriented business functions.
English-language programmes and international admission is a characteristic 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 a broad practical experience, and they understand how to anchor theory in practice through laboratory work, company visits and projects for and in collaboration with companies.

To ensure the usefulness of the content of the programme, the principles of the CDIO education concept are applied, ensuring that the individual courses are continuously reviewed, evaluated and developed.

1 Identity of the Programme

We educate and train the future engineers to have basic knowledge within building and civil works. The focus of the program is to train engineers within project planning and execution of major constructions, infrastructural facilities, as well as planning, control and management of the building and civil works.

The aim of the civil engineering study program is that graduates have acquired skills in describing, formulating and communicating issues and results in a scientific context, as well as the ability to apply scientific method. Furthermore, they must be able to use the results of national and international research, experimental as well as development work.

The purpose of the programme is primarily achieved by:
- Making project work an essential part of the course in which the technical elements of the programme are integrated through problem solving, focusing on use-oriented and practical engineering work. Through the project work, it is also essential that the students develop technical, methodical, communicative and personal competences.
- Collaboration with research environments and companies in connection with the courses.
- Offering an international study environment, in which parts of the programme may be completed abroad.
- Using the student's internship actively to exchange knowledge and experience between VIA and the profession.
- Obtaining application and practice-oriented competences by using VIA's laboratory, workshops and library facilities.

2 Structure and Content

The programme is organized as a full-time higher education. ~~T~~he programme structure, progression and included tests are indicated in the table at the end of this section.

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

ECTS (European Credit Transfer System) indicates the workload and the duration of a study element, but not the severity. One ECTS point corresponds to a workload of 27.5 hours. An academic year of 60 ECTS thus corresponds to 1,650 hours of work for the student.

New students are enrolled once a year in August/September.

English at B level is a prerequisite for understanding the study material and completing the degree program.

The programme consists of:
- Compulsory courses and projects
- Elective courses
- Internship
- Workshops
- Bachelor project

One semester consists of 3-6 delimited courses. One course may have a volume of 5 to 10 ECTS credits, and a project may have a volume of 5 to 20 ECTS credits.

The course topics, scope, learning objectives and tests are described in this curriculum.
For a more detailed and comprehensive description of the individual courses, reference is made to the course descriptions applicable at any time, and available on Studynet.

The programme structure is illustrated below:

Semester Theme	Course	Course	Course	Course/project	Course	
7. Electives	Elective course	Elective course	Elective course	CE-BPR2 Bachelor project		
6. Electives	CE-CMP2 Project and Construction Planning and Management (compulsory)	Elective course	Elective course	CE-BPR1 Preparation of Bachelor Project	CE-SEP6 Semester Project	
5. Internship	CE-INP1 Internship					
4. Urban Infrastructure	CE-CON2 Concrete Structures	CE-INF2 Road Design in Urban Areas	CE-STD4 Computer Aided Structural Analysis	CE-GSW2 Geotechnical Engineering and Civil Works	CE-INO1 Interdisciplinary Innovation project	CE-SEP4 Semester Project
3. Office buildings	CE-BEN2 Building Services, Indoor Environment and Energy Demand Analysis	CE-CMP1 Construction of In Situ Cast Concrete and Pre Cast Concrete Elements	CE-STD3 Structural Design, Concrete Structures and Soil Mechanics		CE-SEP3 Semester Project	
2. Highway around Horsens	CE-SCI2 Calculus, Linear Algebra and Dynamics	CE-INF1 Infrastructure in Rural Areas	CE-STD2 Elastic Strength of Materials and Design of Load Bearing Structures	CE-GSW1 Engineering Geology and Soil Works	CE-HYD1 Hydraulic and Drainage	CE-SEP2 Semester Project
1. Sports hall / Multi centre	CE-SCI1 Mathematical Analysis	CE-BEN1 Building Physics and Building Energy Demand	CE-STD1 Static Analysis and Load Determination	CE-BDE1 Building Design	CE-SSE1 Study Skills for Engineering Students	CE-SEP1 Semester Project

Head of programme may decide that the academic content of a course is taught within the project of the semester in question, as the ECTS scope of the project is increased correspondingly.
This decision may be substantiated in terms of capacity or economics in the current semester.

3 Compulsory Courses of the Programme

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

Each of the four semesters contains a semester project representing 5-10 ects credits. The main purpose of the semester project is to tie the subjects of the semester together to a unified whole.

Project Methodology, Philosophy of Science, Research Methods and Teamwork will be introduced through the programme in connection with semester projects.

There will be a common theme for each semester. Knowledge and skills are acquired through the courses, and competences are acquired and tested through the project work.

1. Semester: Sports Hall/Multi centre
2. Semester: Highway construction in rural areas
3. Semester: Office buildings
4. Semester: Urban infrastructure

3.1 1. Semester: Sports Hall/Multi Centre

The overall theme of the 1st semester is “small sports-/industrial building”.
The students will complete a project with focus on design and execution of certain constructions and installations in a large building including concrete, timber and steel.

The project work is completed in project groups, who cooperate in solving the challenges within the current theme, supported by participation in lectures.

At the end of 1st semester, the students must:
- obtain an understanding of the common rules for project design
- obtain a routine in the composition of project material at a level up to and including the pilot project
- have knowledge of the rules for project planning in connection with smaller sports- / industrial buildings
- have insight into the calculation methods and analytical tools for the execution and planning of a smaller sports or industrial building.

Through planning and design of a smaller industrial building/sports facility, the student must be familiar with the most common principles for design, choice of materials, the building stability as well as leasehold in accordance with the building regulations. Furthermore, the students must calculate and design heating installations and ventilation. The building energy framework shall be calculated and documented.

Group cooperation as well as report writing and presentation technique will be put into practice through the completion of the project.

Content, scope, tests and censorship

Title (code)	Content	Scope	Exam
Building Design (CE-BDE1)	Building Design (BDE) Building Information Modelling (BIM)	5 ECTS	Assessed on the basis of course work Grading based on the Danish 7-point scale No co-examiner

Building physics and building energy demand (CE-BEN1)	U-values and moisture conditions Heat loss Energy consumption Ventilation Building Regulation requirements for buildings energy demands	5 ECTS	Oral test Grading based on the Danish 7-point scale Internal co-examiner
Mathematical Analysis (CE-SCI1)	Transcendental functions Infinitesimal calculation Vectors Motion in space.	5 ECTS	Written test 4 hours Grading based on the Danish 7-point scale External co-examiner
Static Analysis and Load determination (CE-STD1)	Global stability Statical analysis Loads Internal forces for plane beam and frame constructions.	5 ECTS	Written test 4 hours Grading based on the Danish 7-point scale Internal co-examiner
Study Skills for Engineering Students (CE-SSE1)	Study techniques Study tools	5 ECTS	Assessed on the basis of course work Approved / not approved No co-examiner
Semester project: Sports hall/Multi-Centre (CE-SEP1)	Semester project Building Development	5 ECTS	Oral test Grading based on the Danish 7-point scale Internal co-examiner

The learning objectives of the courses (knowledge, skills and competences) as well as test form are set out in Annex 1

3.2 2. Semester: Highway Construction in Rural Areas

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

The project work is completed in project groups, who cooperate in solving the challenges within the current theme, supported by participation in lectures.

The project groups will initiate their own project formulations and plan the project work however, the projects will be subject to certain minimums in relation to the extent and the analysis of the professional elements of the semester.

At the end of the 2nd semester, the students must:
- obtain an understanding of planning and project design of infrastructural facilities
- obtain a routine in the completion of projects in this sector
- skills in applying learned knowledge to the solving of practical infrastructural project works
- the ability to convert the results of lab work into practical project oriented application
- the ability to plan and complete practical project works
- skills in communication of the project results to the client
- be able to use the knowledge obtained and the skills achieved during the semester, in order to perform analyses of infrastructural projects, including applicable solutions
- in cooperation with other students, be able to complete design of infrastructural projects related to the semester theme

Content, scope, tests and censorship

Title (code)	Content	Scope	Exam
Calculus, Linear Algebra and Dynamics (CE-SCI2)	Calculus Linear algebra Particle dynamics	5 ECTS	Oral test Grading based on the Danish 7-point scale Internal co-examiner
Hydraulic and Drainage (CE-HYD1)	Basic hydraulics Main sewerage	5 ECTS	Assessed on the basis of course work Grading based on the Danish 7-point scale No co-examiner
Engineering Geology and Soil Works (CE-GSW1)	Engineering Geology Construction Management and Planning	5 ECTS	Assessed on the basis of course work Grading based on the Danish 7-point scale No co-examiner
Infrastructure in Rural Areas (CE-INF1)	Road types and planning Intersections in rural areas Traditional asphalt types Cross-section with supply installation.	5 ECTS	Oral test Grading based on the Danish 7-point scale Internal co-examiner
Elastic Strength of Materials and Design of Load Bearing Structures (CE-STD2)	Global stability Statical analysis Load effects on buildings and structures	5 ECTS	Oral test Grading based on the Danish 7-point scale External co-examiner
Semester Project: Highway construction in rural areas (CE-SEP2)	Semester project Planning and design of a road construction project in rural areas	5 ECTS	Oral test Grading based on the Danish 7-point scale External co-examiner

The learning objectives of the courses (knowledge, skills and competences) as well as test form are set out in Annex 1

3.3 3. Semester: Office Buildings

Topics
The overall theme of the 3rd semester is “Structural Design – Major Office Buildings”.
The semester project focuses on design, planning, completion of certain constructions and installations in larger buildings of concrete, timber and steel.

The project work is completed in project groups, who cooperate in solving the challenges within the current theme, supported by participation in lectures.

The project groups will initiate their own project formulations and plan the project work: and during the entire project process, the semester lecturers will provide necessary guidance to the project groups.

At the end of the 3rd semester, the students must have:
- obtained an understanding of the planning and design of large buildings
- become experienced in the implementation of building projects
- Obtained an understanding for planning and design for a multi-storey building in concrete and steel
- be able to analyse the prerequisites, limitation and use of calculation methods for the design of building projects
- be able to analyse the interaction between design and execution of part elements in a building project
- have acquired general understanding of the building process’ planning and economy
- have acquired understanding of technical, economical and organizational aspects of the execution phase

- have the ability to analyse a structure for the generation of alternative designs
- have the ability to calculate and design structures in steel, timber, concrete and geotechniques
- be able to perform analysis of building services, and calculate a complete energy framework for the building
- be able to design ventilation system
- be able to understanding the use of IT tools for design, modelling and execution
- be able to use the knowledge obtained and the skills achieved during the semester, in order to plan and design large house building
- have obtained insight into the completion of construction projects and have achieved a certain routine within this area.

Content, scope, tests and censorship

Title (code)	Content	Scope	Exam
Building Services, Indoor Environment and Energy Demand Analysis (CE-BEN2)	Energy consumption in buildings Indoor climate Installations	5 ECTS	Oral test Grading based on the Danish 7-point scale External co-examiner
Structural Design, Concrete Structures and Soil Mechanics (CE-STD3)	Structural Steel Design Concrete Structures Soil Mechanics	10 ECTS	Written test during the semester and Oral test Grading based on the Danish 7-point scale Internal co-examiner at oral test
Construction of In Situ Cast Concrete and Pre Cast Concrete Elements (CE-CMP1)	Resource management of in situ cast concrete constructions and precast concrete element constructions.	5 ECTS	Assessed on the basis of course work Grading based on the Danish 7-point scale No co-examiner
Semester project Design project for a major building (CE-SEP3)	Semester project Planning, design and completion of certain constructions and installations in larger buildings of concrete and steel.	10 ECTS	Oral test Grading based on the Danish 7-point scale External co-examiner

The learning objectives of the courses (knowledge, skills and competences) as well as test form are set out in Annex 1

3.4 4. Semester: Urban Infrastructure

The overall theme of the 4th semester is “Urban Infrastructure”

The students complete projects with a focus on an intersection upgrade in an urban area, including design and planning of certain civil works structures.

The project groups will initiate their own project formulations and plan the project work: and during the entire project process, the semester lecturers will provide necessary guidance to the project groups.

At the end of the 4th semester, the students must have:
- obtained an understanding of the planning and design of urban infrastructural constructions
- become skilled in the execution of projects within this area
- show understanding of the project complexity
- be able to use the knowledge from related courses
- be able to analyse and use the data collected from practical activities and calculations
- set up, describe and interpret the collected data, including the development of competencies
- be able to prepare and present the actual project material

- be able to use the knowledge obtained and the skills achieved during the semester, in order to plan and design construction in urban areas.
- have obtained insight into the completion of construction projects, including applicable soil constructions and have achieved a certain routine within this area.

Volume
30 ECTS

Content, scope, tests and censorship

Title (code)	Content	Scope	Exam
Concrete Structures (CE-CON2)	simple concrete beams columns and walls slabs in both ultimate and serviceability limit states	5 ECTS	Oral test Grading based on the Danish 7-point scale External co-examiner
Road Design in Urban Areas (CE-INF2)	Design of roads and intersections in urban areas.	5 ECTS	Assessed on the basis of course work Grading based on the Danish 7-point scale No co-examiner
Computer Aided Structural Analysis (CE-STD4)	Computer Aided Structural Analysis	5 ECTS	Oral test Grading based on the Danish 7-point scale External co-examiner
Geotechnical Engineering and Civil Works (CE-GSW2)	Concrete retaining structures Sheet pile walls Construction Management Planning	5 ECTS	Oral test Grading based on the Danish 7-point scale Internal co-examiner
Interdisciplinary Innovation project (CE-INO1)	Innovation Creativity Cross-/inter-/multidisciplinary and professional identity	5 ECTS	Written test Grading based on the Danish 7-point scale Internal co-examiner
Semester project: Railway upgrade (CE-SEP4)	Planning, design and execution of an infrastructural construction project.	5 ECTS	Oral test Grading based on the Danish 7-point scale External co-examiner

The learning objectives of the courses (knowledge, skills and competences) as well as test form are set out in Annex 1

4 Workshop Courses

Workshop courses are practice-related courses of one week's duration (not ECTS-triggers). The courses will be conducted in parallel with the 1-4 semester. The following five courses are planned:

BY-PWS1: Company Visits and Workshop
BY-PWS2: Material Knowledge
BY-PWS3: Installations and Welding
BY-PWS4: Laboratory Activities and Field Work and Workshop
BY-PWS5: Laboratory Activities and Field Work and Company Visit

5 Internship

CE-INP1

The internship comprises a semester of 30 ECTS and it is placed on the 5th semester of the programme. The internship period is either paid or unpaid and takes place either in a private or in a public company in Denmark or abroad.

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

The following prerequisites must be met before an internship can commence:
- All courses on 1.-4. semester must be passed / approved
- Workshop courses must be passed / approved or exempted

The student will find an internship, which must be approved by VIA, who appoints a supervisor for the intern.

In cooperation with the company, the student prepares a plan for the internship programme including an assignment formulation.

The basis for the assessment of internship is a continuous reporting from the student to VIA, a feedback from the internship company, as well as a presentation where the supervisor can ask detailed questions about the internship content.

If the internship is terminated, the supervisor must, in consultation with the head of programme, assess whether the internship has had a duration and content sufficient for passing the internship.

The internship is assessed approved / not approved.

6 Courses at 6th and 7th Semester

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

Description of the individual courses is stated in the course descriptions.

In addition to the compulsory course CMP2, a speciality designation consists of two to four specific courses as well as SEP6 and BPR1+2, within the specific subject area (referred to as compulsory below).

It is also possible to choose elective courses offered by VIA's other Programmes, except courses which consists of elements from the student's previous academic record. Selecting courses from other Programmes must be approved by an Engineering study counsellor in order to secure the relevance and an increase of the technical level.

6.1 Compulsory Courses

Compulsory course at 6./7. Semester, for all students on Civil Engineering programme.

Content, scope, tests and censorship

Title (code)	Content	Scope	Exam
Project and Construction Planning and Management (CE-CMP2)	The aim of this course is that students become familiar with requirements for project and construction management and planning obtain knowledge of building project phases, organizational and contractual relationship.	5 ECTS	Oral test Grading based on the Danish 7-point scale External co-examiner
Semester project (CE-SEP6)	Project description of the subject matter of the project, which is to be selected by the student. Carrying out the project including follow up on the time schedule and completion of the planned activities. Documentation of time used according to the project record. Application of computational technology relevant to the project. Documentation and promotion of the project result in a report. Planning of the oral presentation of the project.	10 ECTS	Oral test Grading based on the Danish 7-point scale External co-examiner
Bachelor project preparation course (CE-BPR1)	The main purpose is to prepare the students for their bachelor project. Preparation includes selecting the subject, choosing a project group. Finding a supervisor and maybe an external partner, analyzing the subject, defending the project by oral presentation, and writing a Project Description according to VIA Engineering Guidelines.	5 ECTS	Assessed on the basis of course work, the final project description and its presentation and defence Grading based on the Danish 7-point scale No co-examiner
Bachelor project (CE-BPR2)	Carrying out the project including follow up on the time schedule and completion of the planned activities. Documentation of time used according to the project record. Application of computational technology relevant to the project. Documentation and promotion of the project result in a report. Planning of the oral presentation of the project.	15 ECTS	Oral test Grading based on the Danish 7-point scale External co-examiner A23: ref. annex 1

The learning objectives of the courses (knowledge, skills and competences) as well as test form are set out in Annex 1

6.2 Elective Courses

The following electives are available at the Civil Engineering programme:

Elective courses may be cancelled in case of an insufficient number of students registered for the course.

Electives within the subject area of **Sustainable Energy Design**:

Title (code)	Content	Scope	Exam
Indoor Environment (CE-INE1) Mandatory for the speciality designation	Evaluating the indoor environment, by studying the influence of the physical environment, ie. Thermal, air quality, noise and light on human health, comfort and performance. Measurements of indoor climate parameters. Introduction to Daylight calculations. Simulation of indoor environmental parameters with the software BSIM. Indoor Environmental assessment tool.	5 ECTS	Assessed on the basis of course work Grading based on the Danish 7-point scale No co-examiner A23: ref. annex 1
Sustainable Buildings (CE-SUB1)	Sustainability - The Sustainable Development Goals –17 SDG´s Sustainable Assessment of Buildings. Working with the assessment tool DGNB Integrated Energy Design IED/Integrated design process IDP Sustainable building materials. Working with Life Cycle Assessment (LCA) and Cradle-to-Cradle principals. Energy performance framework Indoor climate i.e. daylight calculation	5 ECTS	Assessed on the basis of course work Grading based on the Danish 7-point scale No co-examiner
Ventilation Systems (CE-VEN1) Mandatory for the speciality designation	Criteria and methods used for design of mechanical ventilation- and climatic systems. Components that ensure low energy consumption and determine strategies for control and operation of such systems. Ventilation system that satisfies human requirements. Principles of natural ventilation.	5 ECTS	Assessed on the basis of course work Grading based on the Danish 7-point scale Internal assessment A23: ref. annex 1
Life Cycle Assessment (SE-LCA1)	Introduction to UNs Sustainable Development Goals, Circular Economony and LCA. Methodes for Life Cycle Assessment (LCA) Impacts from use and reuse of ressources and materials Use of cases to evaluate alternative materials and technologies based on environmental and climate impact	5 ECTS	Written test Grading based on the Danish 7-point scale Internal co-examiner A23: ref. annex 1

Geothermal Systems (SE-STS1)	Facts about the thermal properties of different rock and soil types. The influence of groundwater on borehole heat exchangers. Construction of boreholes, design, and dimensioning of borehole heat exchangers. Thermal response test. Energy storage and balanced heat abstraction. Modelling software Earth Energy Designer (EED).	5 ECTS	Oral test Grading based on the Danish 7-point scale Internal co-examiner A23: ref. annex 1
Thermodynamics and Particle Dynamics (SE-TER1)	Basic Thermodynamics Particle Dynamics.	5 ECTS	Oral test Grading based on the Danish 7-point scale Internal co-examiner A23: ref. annex 1
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	5 ECTS	Oral test Grading based on the Danish 7-point scale No co-examiner

The learning objectives of the courses (knowledge, skills and competences) as well as test form are set out in Annex 1

Electives within the subject area of **Construction Management and Geotechnical Engineering**:

Title (code)	**Content**	**Scope**	**Exam**
Contractors Financial Management (CE-CMP3) Mandatory for the speciality designation	Estimate Charts of accounts Economics, budgets and calculation principles Cash budget Managing of own production Managing of subcontractors Additional works Site meetings and safety meetings Calculation and reporting Lean Construction management JIT and 5S Last Planner SystemTM , PPC and 5xWHY Kaizen Waste	5 ECTS	Assessed on the basis of course work Grading based on the Danish 7-point scale No co-examiner A23: ref. annex 1
Deep Excavations and Slopes in Urban Areas (CE-GEO1) Mandatory for the speciality designation	Execution of construction pits Installation methods for retaining walls. Influence of groundwater on excavations. Design of ground water lowering installations	5 ECTS	Oral test Grading based on the Danish 7-point scale External co-examiner

Geotechnical Design (CE-GEO2) Mandatory for the speciality designation	Risk of punch through for foundations on thin soil layers Pile foundations (plane pile works /piles in groups) Strengthening of soil and deep compaction Design of ground anchors and anchor length Stability calculations Design of steel in Ground Engineering	5 ECTS	Oral test Grading based on the Danish 7-point scale Internal co-examiner In A23 assessed on the basis of course work, ref. annex 1
Advanced Geotechnical Design (CE-GEO3)	Analysis of retaining walls by use of FEM (Finite Element Method) Parameter and sensitivity analysis of input parameters for design calculations Retaining walls with multiple support levels Execution of inclinometer measurements Geotechnical design report	5 ECTS	Assessed on the basis of course work Grading based on the Danish 7-point scale No co-examiner
Infrastructure – Planning, Design and Maintenance of Road Projects in Urban Areas (CE-INF5)	Plan and design urban infrastructure project, such as parking spaces and traffic terminals. Identify and describe the workflow and roles of stakeholders involved in the project, from initial ideas to operation and maintenance. Carry out project documentation from outline design phase to operation and maintenance phase	5 ECTS	Assessed on the basis of course work Grading based on the Danish 7-point scale No co-examiner A23: ref. annex 1
Sustainable Drainage (CE-SUD1)	Climate change Precipitation sea water level rising Methods to handle rain water locally. Reuse of rainwater. Green roofs. Infiltration basins. Open channels Use of Scalgo	5 ECTS	Assessed on the basis of course work Grading based on the Danish 7-point scale No co-examiner A23: ref. annex 1
Life Cycle Assessment (SE-LCA1)	Introduction to UNs Sustainable Development Goals, Circular Economony and LCA. Methodes for Life Cycle Assessment (LCA) Impacts from use and reuse of ressources and materials Use of cases to evaluate alternative materials and technologies based on environmental and climate impact	5 ECTS	Written test Grading based on the Danish 7-point scale Internal co-examiner A23: ref. annex 1

The learning objectives of the courses (knowledge, skills and competences) as well as test form are set out in Annex 1

Electives within the subject area of **Infrastructure**:

Title (code)	Content	Scope	Exam
Basic Railway and Light rail - Planning and Design (CE-INF3) Mandatory for the speciality designation in A22 (6th sem.), but not in A23.	Requlation: Track engineering rules and railway norms. Railway/light rail planning. General layout of a railway line. Basis open line design. Design of simple cross sections including ballast, gauge structure, drainage etc. Speed profile for a railway track/light rail track	5 ECTS	Assessed on the basis of course work Grading based on the Danish 7-point scale No co-examiner
Infrastructure – Planning and Design of Roundabouts (CE-INF4) Mandatory for the speciality designation	Analyse capacity in roundabouts. Plan and design roundabouts. Choice of materials and pavements. Design of roundabouts. Traffic flow during construction works. Traffic safety measures.	5 ECTS	Assessed on the basis of course work Grading based on the Danish 7-point scale No co-examiner
Infrastructure – Planning, Design and Maintenance of Road Projects in Urban Areas (CE-INF5) Mandatory for the speciality designation	Plan and design urban infrastructure project, such as parking spaces and traffic terminals. Identify and describe the workflow and roles of stakeholders involved in the project, from initial ideas to operation and maintenance. Carry out project documentation from outline design phase to operation and maintenance phase	5 ECTS	Assessed on the basis of course work Grading based on the Danish 7-point scale No co-examiner A23: ref. annex 1
Contractors Financial Management (CE-CMP3)	Estimate Charts of accounts Economics, budgets and calculation principles Cash budget Managing of own production Managing of subcontractors Additional works Site meetings and safety meetings Calculation and reporting Lean Construction management JIT and 5S Last Planner SystemTM , PPC and 5xWHY Kaizen Waste	5 ECTS	Assessed on the basis of course work Grading based on the Danish 7-point scale No co-examiner A23: ref. annex 1
Deep Excavations and Slopes in Urban Areas (CE-GEO1)	Execution of construction pits Installation methods for retaining walls. Influence of groundwater on excavations. Design of ground water lowering installations	5 ECTS	Oral test Grading based on the Danish 7-point scale External co-examiner

Sustainable Drainage (CE-SUD1) Mandatory for the speciality designation up to and including A22 (7. sem)	Climate change Precipitation sea water level rising Methods to handle rain water locally. Reuse of rainwater. Green roofs. Infiltration basins. Open channels Use of Scalgo	5 ECTS	Assessed on the basis of course work Grading based on the Danish 7-point scale No co-examiner A23: ref. annex 1

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Electives within the subject area of **Structural Design**:

Title (code)	**Content**	**Scope**	**Exam**
Element Building – Concrete Statics (CE-ELM1) Mandatory for the speciality designation	Statically indeterminate wall structures In-plane stress conditions for reinforced concrete diaphragms The effective design concrete compressive strength Strut and tie model The stringer method Shear walls Diaphragms (the storey partition) Casting joints calculation Design of joints	5 ECTS	Oral test Grading based on the Danish 7-point scale External co-examiner
Finite Element Method for Frame and Plate Structures (CE-FEM1) Mandatory for the speciality designation	The emphasis of the course is on the terminology and techniques in modern structural modeling. The target is on the adoption of the FE approach and commercial FE software packages. Specific subjects introduced include parametric geometry generation (MATLAB), direct stiffness method, (MATLAB) specifications of properties, releases, materials and loads (STAAD Pro).	5 ECTS	Assessed on the basis of course work Grading based on the Danish 7-point scale No co-examiner A23: ref. annex 1
Masonry Structures (CE-MAS1)	Masonry structures Masonry beams Wall ties Movement joints Shear walls Arches Reinforced masonry	5 ECTS	Oral test Grading based on the Danish 7-point scale Internal co-examiner
Steel Structures (CE-STU1) Mandatory for the speciality designation as of A22 (6. sem.)	Structural systems. Welded plate girders. Buckling of plates Stiffeners Lateral torsional buckling, Bracing systems for compression members Steel connections.	5 ECTS	Oral test Grading based on the Danish 7-point scale External co-examiner From A23 internal assessment, ref. annex 1

Timber Structures (CE-TIM1) Mandatory for the speciality designation	Wood materials. Moisture content and load duration. Structural timber. Glued laminated timber. Wood-based panels. Tension/compression bars, beams, moment loaded compression bars. Lateral torsional buckling Roof and wall diaphragms. Connections with nails and bolts. Tapered Beams Curved Beams Pitched cambered beam Trusses Glued thin-flanged beams Frames and bracing of timber buildings Connections with screws, dowels, glued in bolts, toothed shear plates. Fire resistance	5 ECTS	Oral test Grading based on the Danish 7-point scale External co-examiner From A23 internal assessment, ref. annex 1
Deep Excavations and Slopes in Urban Areas (CE-GEO1)	Execution of construction pits Installation methods for retaining walls. Influence of groundwater on excavations. Design of ground water lowering installations	5 ECTS	Oral test Grading based on the Danish 7-point scale External co-examiner
Geotechnical Design (CE-GEO2) Recommended for the speciality designation up to and including A22 (7. sem.)	Risk of punch through for foundations on thin soil layers Pile foundations (plane pile works /piles in groups) Strengthening of soil and deep compaction Design of ground anchors and anchor length Stability calculations Design of steel in Ground Engineering	5 ECTS	Oral test Grading based on the Danish 7-point scale Internal co-examiner A23: ref. annex 1
Advanced Geotechnical Design (CE-GEO3) - recommended for the speciality designation up to and including A22 (7. sem.)	Analysis of retaining walls by use of FEM (Finite Element Method) Parameter and sensitivity analysis of input parameters for design calculations Retaining walls with multiple support levels Execution of inclinometer measurements Geotechnical design report	5 ECTS	Assessed on the basis of course work Grading based on the Danish 7-point scale No co-examiner

The learning objectives of the courses (knowledge, skills and competences) as well as test form are set out in Annex 1

7 Bachelor Project

CE-BPR1
CE-BPR2

The programme is concluded with a bachelor project (BPR2) which constitutes 20 ECTS and is assessed with an oral test. The bachelor project commences on the 6th semester (BPR1), where the student must choose the subject for the project and prepare the project description.

The Bachelor project must demonstrate individual self-critical reflection within the chosen subject, and must document the student's ability to apply engineering theories and methods. In addition, the bachelor project must reflect the student's ability to express himself professionally and structured within his subject.

BPR1 is expected to be approved before BPR2 begins.
The condition for assessment of the bachelor project, BPR2, is that the student has passed all other courses.

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

The Bachelor project comprises an independent experimental, empirical and / or theoretical examination of a practical problem formulation related to the core subjects of the programme.

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

The students are examined in the project by an oral test / group test with individual assessment according to the learning objectives described under section 1 of this curriculum. The basis for the exam is the bachelor project. It is a prerequisite for participation in the exam that the bachelor project is handed in within the stipulated deadline, and that it meets the project requirements described.

The examination may take place at the earliest when all the other tests of the programme, including internship, have been passed. The examination is assessed on the 7-point scale and with the participation of external examiner.

8 Title and Issue of Diploma

Graduates who have completed the studies under this curriculum as well as the joint regulations for VIA Engineering is entitled to use the title Bachelor of Engineering in Civil Engineering.

For the completion of the programme, VIA University College issues a diploma, specifying the title as well as the result of the achieved assessments. The diploma furthermore details 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 graduates will receive the diploma in e-Boks no later than 5 weekdays after graduation.

9 Annex 1: Course overview, learning goals and test forms

Code	Title	ECTS-points	Knowledge	Skills	Competences	Test
CE-BDE1	Building Design	5	After completion of the course, the student must have knowledge about: BDE: - Describe common building terminology - Identify and outline typical of building materials and structures - Explain and design common building constructions - Explain and understand project phases - Design Methodology BIM: - Describe the concept of BIM processes and advantages/challenges - Identify basic principles for modelling with 3D softwares and methods for composition of 3D building models in compliance with existing common principals from e.g. Det digitale Byggeri (Digital Building) and BIPS	After completion of the course, the student must be able to: Building design: - Apply the regulations of the Planning Law for national, regional and municipal planning. - Work in accordance with current regulations for projecting and building legislation - Design and demonstrate relevant choice of materials and construction for the building envelope and static structure. - Perform field work with measurement and registration of building components Building Information Modelling (BIM): - Apply 3D tools in the planning of a project. - Implement BIM methods, allowing extract of data for further processing and analysis in associated programmes - Plan and execute drawings, belonging to the relevant phases in the execution of a project.	BDE + BIM: The course substance is used in the term project, which will give the student an exercise in applying the theory in a context that ensures understanding of how a project material is constructed and designed: - Understand the complexity of design solutions. - Be able to choose, plan and control a project's technical solutions appropriately.	Prerequisites: Course assignments handed in before deadline. Type of examination: 4 sets of assignments (of which 3 are individual) These assignments will each provide 25 % of the final grade. Allowed tools: NA Re-exams:
CE-BEN1	Building physics and building energy demand	5	Following completion of the course, the student can: Understand and explain the calculation methods for heat transmission coefficients and the heat loss from a building. Understand and explain building components moisture conditions (Hygrothermal conditions). Outline the Building Regulation requirements for buildings energy demands, given for new buildings. Understand the calculation methodology for buildings energy consumption. Describe the design process of the ventilation system (Outline proposal level).	Following completion of the course, the student can: Calculate heat transfer coefficients for the building envelope components (U-values) Calculate moisture conditions in the building envelope components. Apply heat loss calculations to determine the building's heat emitters. Evaluate the amount of ventilation in a building and illustrate physical planning with 3D tools Calculate the energy demands of the building according to the Building Regulations.	Following completion of the course, the student can: Design and evaluate the building envelope with focus on U values, linear losses, and moisture conditions. Evaluate the influence of a thermal cold bridge on the u value. Evaluate a building's heat loss and design of heaters in the building (radiators, etc.) (Outline proposal) Design a ventilation system (Outline proposal) Analyse the building's energy demand according to the building regulations Explain the impact of the building envelope, the ventilation and the heating system on the total energy demand of the building.	Prerequisites: None Type of examination: Individual oral exam with an internal examiner. The exam is based upon a subject found by draw, and with no preparation. Allowed tools: No tools allowed. Re-exams: Conducted as the ordinary exam.

Code	Title	ECTS-points	Knowledge	Skills	Competences	Test
CE-BEN2	Building services, indoor environment and energy demand analysis.	5	Following completion of the course, the student can: Describe all building services and their purpose. Identify and explain the indoor climate parameters and their impact on the ventilation and management and thereby the building´s energy demand. Explain the method of testing for building air tightness (blowerdoortest and thermography) as well as identifying critical points in the building envelope. Account for the Building Regulations requirements for building energy demand, indoor climate and building services. Outline the traditional and renewable forms of heating sources. Describe the sustainability principle and explain the Danish sustainability certification method DGNB. Explain BIM and the application of 3D design of building services.	Following completion of the course, the student can: Design and evaluate building services, water, heating and drainage (project proposal level)Design the ventilation system and understand indoor climate parameters and the management of the ventilation (project proposal level).Apply and illustrate the concept of integrated energy design when calculating the energy demands of buildings. Calculate and assess a room´s daylight conditions. Illustrate and solve critical points of the structure in relation to the air-tightness and thermal bridges, including 2-dim calculations of heat transfer through thermal bridges. Apply BIM strategy and illustrate 3D design of ventilation, including demonstrating extraction of quantities, collision check and quality assurance.	Following completion of the course, the student can: Design the building services and ventilation (project proposal level) Plan physical coordination of building services and ventilation with respect for building constructions using 3D tools. Design, analyse and reflect on the importance of the various parameters for the building's energy demand, calculated in accordance with the building regulations.	Prerequisites: None Type of examination: Individual oral exam with an external examiner app. 20 min. per student (grading included). Exam is based upon a subject found by draw and with 20 min. preparation after the draw. Allowed tools: All tools allowed during preparation. Notes from preparation are allowed during exam. Re-exams: Conducted as the ordinary exam.
CE-CMP1	Construction of In Situ cast concrete and Pre Cast concrete elements	5	After completion of the course, the student must have knowledge about: – Theory and methods for casting of in situ cast concrete constructions, such as formwork systems, reinforcement as well as choice of concrete according to environmental classes. – Theory and methods for planning a safe construction site. – Theory and methods to choose the crane type, size and location. – Various concepts and methodologies adhering to the planning, design and assembly processes of the use of precast concrete elements in building projects. – Various precast concrete element types, together with a review of typical key connection details and other drawings in connection with precast concrete building projects. – Distribution models for design, delivery and assembly of precast concrete elements will be reviewed using BIPS A113 as a basis.	After completion of the course, the student must be able to: – Possess knowledge of different formwork systems (traditional form/system form) as well as be able to dimension/pick out these. – Calculate formwork pressure from the concrete on horizontal and vertical formwork. – Calculate the required maturity of the concrete before the formwork can be dismantled. – Possess knowledge of concrete production. – Possess knowledge of to prevent damage to newly cast concrete. – Perform planning for reinforcement work, such as choice of reinforcement type, environmental class, and apply rules for reinforcement placement in the formwork. – Prepare cut and bending lists of reinforcement bars for carrying out reinforcement units. – Perform planning of a safe construction site. – To choose crane type, size and decide on a location for erection on	After the course, the student will be able to apply knowledge and skills to: - The students must present abilities of analyzing, argue, explain and exemplify within the scope of the 3th semester project. – The course provides the students with a general ability to work with in situ cast concrete constructions and precast concrete projects as a project assistant on site for the construction site management. – The course gives the students a basic knowledge about the contractors' resource management in relation to construction projects. – The student will acquire such a knowledge about in situ cast concrete construction and precast concrete element projects, which they can plan and carry out measures of various concepts and methodologies adhering to the planning of the execution of a construction project.	Prerequisites: One mandatory midterm and one end-term evaluation made and accepted. Each team must act as opponent in this evaluation. Type of examination: The course is examined through the term project, being a part of the term project examination. Allowed tools: As for semester project (SEP3) Re-exams:

Code	Title	ECTS-points	Knowledge	Skills	Competences	Test
				the building site. – Possess knowledge of the use of prefabricated concrete elements in building projects. – Possess knowledge of the planning, design and assembly process. Associated with relevant concepts. – Apply knowledge of precast concrete design processes to prepare drawing information for a precast concrete production and assembly. – Apply knowledge of BIPS A113 to enable appropriate decisions for the distribution of services and responsibilities for the design, production and assembly of precast concrete projects. – Demonstrate an understanding of the basics of building phases.		
CE-CON2	Concrete structures	5	The student must achieve knowledge to complete the analysis of simple concrete beams, columns and walls together with slabs in both the ultimate and the serviceability limit states.	Concrete structures: After the completion of this course the students must: - Be able to calculate and use MN-interaction diagrams for reinforced concrete cross-sections. in the serviceability limit state, - possess knowledge of the demands for concrete structures. - be able to calculate stresses by mean of the “Transformed cross-section method” and - be able to calculate deflections and crack widths in concrete beams and slabs. for columns and walls in the ultimate limit state: - be able to determine the loadbearing capacity of centrally loaded columns - be able to determine the loadbearing capacity of eccentrically and transversely loaded columns using the “Method of nominal stiffness” and “Method II”. - be able to calculate walls using the “EC2- simplified method for walls and columns” as well as the “Danish Element formula” - Be able to calculate continuous	The student must be able to use the acquired knowledge and skills within all subject areas during the semester, to collaborate with other student, in the planning, design and performing of the subjects in the semester project. Furthermore, the student must be able to solve simple design tasks during the internship at a consultant engineering company or contractor.	Prerequisites: In order to register for exam, ALL course assignments must be handed in on Itslearning during the semester. At least 80% of the assignments must be handed in before a given deadline in order to register for the exam. Type of examination: Oral Exam with an external examiner. 25 minutes per student in total incl. grading. The exam will be based on course assignments solved and handed in during the semester. The student must bring all the assignments on paper for the exam. There is no preparation time before the exam. On the exam day, there will be a draw between the subjects covered by the course assignments. Several course assignment may enter into the drawn subject. Re-exams: Oral exam using the same method as the ordinary exam.

Code	Title	ECTS-points	Knowledge	Skills	Competences	Test
				concrete beams and one-way spanning slabs according to the lower bound solution method from the translated textbook “Bjarne Christian Jensen, Concrete structures in accordance with DS/EN 1992-1-1”- chapter 10.1 and 10.4. - Be able to calculate two-way spanning slabs according to the translated textbook “Bjarne Christian Jensen, Concrete structures in accordance with DS/EN 1992-1-1”- chapter 10.5 (a lower bound solution). - Be able to calculate two-way spanning slabs by means of the Strip Method. (a lower bound solution) - Be able to possess knowledge of curtailment of reinforcement in concrete beams, when taking into consideration the effect of the shear in the Diagonal Compression Field Method. Common for all subject areas: - In all the subjects above, the student must after the course, be able to communicate clearly both orally as well as in writing, especially by being able to visualize the calculations with relevant sketch-es that show the applied calculation model, preconditions etc.		
CE-GSW1	Engineering Geology and Soil Works	5	After completion of the course, the student must have knowledge about: Engineering Geology: - The important geological processes and resulting materials in Denmark - The different types of geological maps and borehole information’s and how this information is obtained digital and how they are used in consideration of expected soil layers in a given area. - The most common soil types and their Geotechnical characteristics as well as potential for re-use. - Ground water and ground water flow - Climate change	After completion of the course, the student must be able to: Engineering Geology: - Recognize and describe the most common types of soil. - Carry out a hand drilling, collect samples, and perform common laboratory tests. - Gather geological information about a given area and draw a cross section from given boreholes and illustrate expected soil layers between boreholes. - Develop a cross section showing the potential for re-use of soil. - Use databases and maps for preliminary screening of a given area	Engineering Geology: - Evaluate expected soil layers and ground water conditions for a given area/site and conclude related consequences for the given construction project on the site. Management: - Understand the complexity of planning in general. - Planning of soil works in connection with a road construction project	Prerequisites: Semester tests completed on time. Type of examination: The Students are graded based on the basis of course assignments and/or tests during the course. Allowed tools: None Re-exams: Individual oral exam with an internal examiner. Exam is without preparation based upon a subject found by draw. Any second re-exam will be held similar to the first re-exam.

Code	Title	ECTS-points	Knowledge	Skills	Competences	Test
			- Contaminated soil: classification of sites and its and influence on soil handling. Construction Management and Planning: - Basic planning methods - Most common planning tools including IT-tools - The relationship between manpower, machinery and materials - Planning and execution of soil works	for contaminated soil - Assessment of soil handling on the basis of contamination risk and area classification Construction Management and Planning: - Divide a process into activities and estimate their time consumption. - Identify processes and links between activities. - Analyse, choose and apply appropriate planning tools. - Document and carry out resource planning through MS Project - Calculate quantities and define duration of soil works tasks		
CE-GSW2	Geotechnical Engineering and Civil Works	5	After completion of the course, the student will have knowledge about: GEO: – Soil pressure on concrete retaining structures according to zone failure – Theory and methods to design free sheet pile walls and anchored sheet pile walls with 0 plastic hinges according to Brinch Hansen. - Design of King post walls. CMP: - Jobsite planning for civil works projects in an urban environment - Pricing of civil works projects - Risk management on construction projects - Location based planning using VICO Schedule Planner software	After completion of the course, the student will be able to: GEO: - Calculate soil pressure on concrete retaining walls for vertical wall and inclined walls according to zone failure theory. - Undertake analysis and calculations on free sheet pile walls and sheet pile walls with one anchor level according to Brinch-Hansens soil pressure theory. - Apply SPOOKS software for design of free and anchored sheet pile walls for basic failure mechanisms. - Design steel sheet piles according to Eurocode 3 part 5, under consideration of bending moment, corrosion loss and cross sectional class. CMP: - Through appropriate and thorough analysis of machinery and workforce, create a realistic time schedule by the usage of an appropriate IT-planning tool. - Pricing of civil works projects by use of MOLIO price data base - Identify and manage risks in civil works projects - Perform simple planning tasks in VICO Schedule planner (location based planning tool)	Within GEO After the course, the student will be able to carry out ULS design of retaining structures and sheet pile walls without ground water flow according to Eurocodes. The students will be able to specify design basis with relevant soil- and ground water conditions as well as load situations for retaining structures. The students will also be able to suggest an appropriate steel sheet pile profiles from a catalogue of an actual sheet pile manufacturer and an appropriate steel profile for king posts under consideration of bending moment. Within CMP: Planning and pricing of civil works project in an urban environment. Furthermore the students will be able to analyse the impact of the construction works on the surrounding environment. The students will also be able to identify risk and setup a risk management scheme to minimize risks in civil works projects.	Prerequisites: All course works must be handed in before the deadline. Type of examination: The examination is a 20 min. individual oral examination with an internal examiner. Exam is without preparation and based upon a subject found by draw. Allowed tools: None Re-exams: Individual oral examination without preparation based upon a topic found by draw, similar to the first examination. Any third exam is an individual oral examination without preparation based upon a subject found by draw.
CE-HYD1	Basic hydraulics and design of	5	After completion of the course, the student must have the knowledge of:	After completion of the course, the student must have the skills to:	After completion of this course, the student must have the competences	Prerequisites:

Code	Title	ECTS-points	Knowledge	Skills	Competences	Test
	sewer systems		• The physics of basic hydraulics • The design of dewatering systems	Basic Hydraulics: • Determine type of flow • Use energy equation • Calculate single and pipe losses • Calculate hydraulic and energy grade line • Use resistance, exponential and C&W's formula • Calculate combined networks Sewer systems: • Calculate inlet to rain water and waste water pipelines • Design and dimension rain water and waste water pipelines • Perform back water calculations • Design CSOs/weirs and basins	to: • Understand hydraulic problems • Plan and dimension: - Urban sewer systems - Dewatering systems along roads in rural areas	Type of examination: 4 sets of homework must be made, and one old exam set to be made in class. Homework and old exam set will each provide 20 % of the final grade. Allowed tools: Not applicable Re-exams:
CE-INF1	Infrastructure - Highway Design in rural Areas	5	After completion of the course, the student must have the knowledge of: • Road types and planning • Intersections in rural areas • Traditional asphalt types and use of these in road constructions • Supply installations related to highway design	After completion of the course, the student must have the skills to: • Perform analyses and road planning in rural areas • Carry out an environmental screening • Determine design parameters for a road project • Propose relevant design of horizontal and vertical alignments, as well as, cross sections • Describe elements in horizontal and vertical alignments • Describe elements within a cross section, including drainage principles for roads in rural areas • Describe why and where superelevation is used and how a cross section changes from roof crown profile to being superelevated • Perform capacity calculations for a free road section • Dimention road pavement structures based on the catalogue method • Use MicroStation and InRoads for geometrical design of roads and to draw out quantities from the 3D model • Setup and prepare road drawings for print	After completion of this course, the student must have the competences to: • Determine a roads lay-out in regards to Danish Roads Standards and surrounding environment • Design a bypass road in 3D using MicroStation and InRoads Design and planning of cross-section with supply installation.	Prerequisites: The students must solve course assignments based on the knowledge and skills achieved through the course. The assignments must be handed-in prior to the examination day through WISEflow. Furthermore, drawings shall be delivered as two printed copies – details are provided in class. Type of examination: The examination is a 20 min. individual oral examination without preparation based upon a course assignment found by draw. The exam is with an internal examiner. Allowed tools: None Re-exams: Individual oral examination without preparation based upon a course assignment found by draw, similar to the first examination. Any second resit is an individual oral exam without preparation based upon a subject found by draw (not course assignments).
CE-INF2	Road Design in Urban Areas	5	After completion of the course, the student must have the knowledge of: • Intersection types and use of these in urban areas	After completion of the course, the student must have the skills to: • Determine road pavement structures based on NE10 calculations	After completion of this course, the student must have the competences to: • Compare various pavement structures and analyse the quality of sub-base materials	Prerequisites: Course assignment handed in before deadline. Type of examination: Students are graded based on course

Code	Title	ECTS-points	Knowledge	Skills	Competences	Test
				• Design cross sections for roads in urban areas • Execute traffic counts and handle traffic data • Perform and evaluate capacity calculations for simple prioritized- and signal controlled intersections • Design a 3-legged intersection in 2D using MicroStation • Perform road laboratory tests to determine the optimal moisture content and maximum dry density of sub-base material, and to control the quality of sand and stabilized gravel • Perform field tests to determine the compaction of soil	• Analyse and compare the capacity of simple prioritized- and signal controlled intersections • Explain which factors influence the maximum compaction of a sub-base material • Analyse and compare results from road laboratory- and field tests	assignments (50%) and tests (50%) carried out during the course. Allowed tools: None Re-exams: Individual oral exam with an internal examiner. Exam is without preparation based upon a subject found by draw (not course assignments). Any second resit is an individual oral exam with an internal examiner. Exam is without preparation based upon a subject found by draw (not course assignments).
CE-INO1	Engineering Innovation Weeks (BY and CE)	5	After having successfully completed the course, the students will have gained: - An understanding of innovation and its uses within the field of engineering. - Knowledge about Design Thinking (double diamond) process. - Knowledge about how to create a systematic and measurable progress in innovation tasks	After having successfully completed the course, the students will be able to: - Engage in innovative processes in a cross-/inter-/multidisciplinary setting. - Conceive, plan, and execute innovative ideas. - Work methodically with innovation. - Collect and apply relevant information about technologies, markets and end users	After having successfully completed the course, the students will have gained competences in: - Introducing innovative ideas into project work. - Contributing own professional skills in teams with the objective of solving problems by using innovative processes and models. - Clarifying multidisciplinary group competencies	Prerequisites: Mandatory assignments handed in before deadline and accepted. Attendance 80% Type of examination: Individually writtten multiple choice test, with a duration of 30 minutes, performed without aids. Internal examiner. (20/25 correct answers is required to pass the test). Allowed tools: No tools allowed (besides laptop for test) Re-exams:
CE-INP1	Engineering Internship (CE-)	30	The student must: • gain knowledge of theory, methodology and practice within a profession or one or more fields of study • be able to understand and reflect on theories, methodology and practice • be aware of non-technical – societal, health and safety, environmental, economic and industrial – implications of engineering practice.	The student must: • be able to apply the methodologies and tools of one or more fields of study and to apply skills related to work within the field/fields of study or profession • be able to assess theoretical and practical problems and to substantiate and select relevant solutions • be able to communicate professional issues.	The student must: • be able to handle complex and development oriented situations in study or work contexts • be able to independently participate in professional and interdisciplinary collaboration with a professional approach • be able to identify own learning needs and to organise own learning in different learning environments • promote an engineering-oriented approach during the remaining semesters on the Bachelor programme • develop personal skills required for the professional career as engineer • form the basis for developing personal/professional network	Assessed on the basis of mandatory assignments: • Expected outcome/specific learnings targets for the internship position • Company presentation • Logbook • Main academic assignment(s) • Final reflections • Recommendation letter from the company • Participation in workshop for coming interns
CE-SCI1	Mathematical Analysis (CE-)	5	The student will get knowledge about:	After the completion of the course, the student will be able to:	After completing the course, the student can:	Prerequisites: None

Code	Title	ECTS-points	Knowledge	Skills	Competences	Test
			• Differentiation • Trigonometric functions • Exponential functions • Integration • Vectors in space • Vector functions in space	• 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.	• 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.	Type of examination: 4 hours written exam with external examiner. Allowed tools: All tools are allowed, apart from the internet. Reexams: Method will be equal to the ordinary exam.
CE-SCI2	Calculus, Linear Algebra and Dynamics (CE-)	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 Law´s 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.	Prerequisites: Upload of course assignments in WISEflow approximately one week before the exam. Type of examination: Individual oral examination with an internal examiner. 20 min. Exam is based upon course assignment(s) found by draw and without preparation. Allowed tools: None Re-exams: Method will be equal to the ordinary exam.
CE-SEP1	Semester project - Building Development	5		Through the design of a minor commercial structure, the student must become familiar with the most	At the end of the semester, the students must: - Obtain knowledge on regulations of	Prerequisites: Project description must be duly handed in and approved in order to register for exam

Code	Title	ECTS-points	Knowledge	Skills	Competences	Test
				common construction principles, choice of materials, the stability of the building and layout according to the building regulations. The student must be able to evaluate the building envelope in terms of energy aspects and design heating installations and ventilations system for scheme design. Through completion of the project, group cooperation, report writing and presentation technique will be put into practice. In the course, IT figures as a pedagogical method. The aim is that IT will support the learning process of the students and their understanding of the engineering–technical possibilities in the application of BIM modelling, simulation etc.	design of small commercial construction. - Have insight into the calculation methods and analysing tools in relation to the design and planning of small industrial/sports facility building	in the study project. 8 weeks after study start. Type of examination: Oral exam with an internal examiner. Group presentation and an individual examination following. Allowed tools: NA Re-exams: Students who failed a semester project in January or June must attend an information meeting on the last Friday in June. At this meeting, the students will get information on specific deadlines as well as the process of re-exam. They will form new groups, if possible in relation to the number of failed students at the individual semesters. Based on the feedback, the students have received after the ordinary exam, they must prepare a new project, or the failed project must be improved. Deadline for hand in of the project is mid-August (exact date will be informed at the meeting). There will be no guidance in the period up to hand in. The project is assessed at an oral exam.
CE-SEP2	Semester project 2	5	The students must obtain an understanding of planning and design of a road construction project in rural areas.	The students will obtain skills • To show understanding of the entire project complexity • To use the gained theoretical knowledge in practical activities • To analyse and use data gathered from practical activities and calculations • To set up, describe and interpret the collected data Through completion of the project, group cooperation, report writing and presentation technique will be put into practice. The course includes IT as a pedagogical method. The purpose is to support the students' learnings processes and their understanding of the engineering opportunities.	At the end of the semester, the students must: • Be able to use the knowledge obtained and the skills achieved during the semester, in order to plan and design construction in open areas	Prerequisites: The project report must be submitted before the deadline. Type of examination: Group presentation followed by an individual examination with an external examiner. Allowed tools: NA Re-exam: Students who failed a semester project in January or June must attend an information meeting on the last Friday in June. At this meeting, the students will get information on specific deadlines as well as the process of re-exam. They will form new groups, if possible in relation to the number of failed students at the individual semesters. Based on the feedback, the students have

Code	Title	ECTS-points	Knowledge	Skills	Competences	Test
						received after the ordinary exam, they must prepare a new project, or the failed project must be improved. Deadline for hand in of the project is mid-August (exact date will be informed at the meeting). There will be no guidance in the period up to hand in. The project is assessed at an oral exam.
CE-SEP3	Semester project - Design project for a large building	10	The student must obtain an understanding of the planning and design of large buildings as well as become experienced in the implementation of building projects.	Through the project, the student must become familiar with the design, calculations and execution of parts of the construction project and installations in a larger building in concrete and steel. Through completion of the project, group cooperation, report writing and presentation technique will be put into practice. The students will obtain skills – To show understanding of the entire project complexity – To use the gained theoretical knowledge in practical activities – To analyse and use data gathered from practical activities and calculations – To describe and complete a report, including presentation material – To present the project material In the project IT figures as a pedagogical method. The aim is that IT will support the learning process of the students and their understanding of the engineering technical possibilities in the application of BIM modeling, simulation etc.	At the end of the semester, the students must: – Be able to use the knowledge obtained and the skills achieved during the semester, in order to plan and design a large building – Obtain insight into the completion of construction projects and have achieved a certain routine within this area.	Prerequisites: Project description must be duly handed in and approved in order to register for exam in the study project. Finally the project report must be duly handed in. Type of examination: Oral exam with an external or internal examiner. Group presentation and an individual examination following. Allowed tools: NA Re-exam: Based on the feedback, the students have received after the ordinary exam, they must prepare a new project, or the failed project must be improved. The students will be informed of specific deadlines as well as the process of re-exam. They will form new groups, if possible in relation to the number of failed students at the individual semesters. There will be no guidance in the period up to hand in. Grade is given on the basis of the updated or new project without oral defence.
CE-SEP4	Semester project 4th semester	5	The students must obtain an understanding of planning and design of an infrastructural construction project. Furthermore, they must be skilled in the execution of projects within this area.	• To show understanding of the entire project complexity • To use the gained theoretical knowledge in practical activities • To analyse and use data gathered from practical activities and calculations • To set up, describe and interpret the collected data Through completion of the project, group cooperation, report writing and presentation technique will be put into practice.	At the end of the semester, the students must: • Be able to use the knowledge obtained and the skills achieved during the semester, in order to plan and design an infrastructure construction.	Prerequisites: Project description must be duly handed in and approved in order to register for exam in the study project. Finally the project report must be duly handed in. Type of examination: Group presentation followed by an individual examination with an external examiner. Allowed tools: NA

Code	Title	ECTS-points	Knowledge	Skills	Competences	Test
				The course includes IT as a pedagogical method. The purpose is to support the students' learnings processes and their understanding of the engineering opportunities.		Re-exam: Based on the feedback, the students have received after the ordinary exam, they must prepare a new project, or the failed project must be improved. The students will be informed of specific deadlines as well as the process of re-exam. They will form new groups, if possible in relation to the number of failed students at the individual semesters. There will be no guidance in the period up to hand in. Grade is given on the basis of the updated or new project
CE-SSE1	Study Skills for Engineering Students (CE)	5	The student should be able to: • Explain the study activity model (SAM), and SOLO taxonomy and describe their uses • Explain the strengths and weaknesses of Problem-Based Learning (BPL) • Outline the stages of team development (such as the Tuckman stages) and how this model can be of use to a project team • Describe the purpose of a project report and a process report and explain the content of the typical main sections of each • Explain the phases of a project (project initiation, project definition, project execution and project evaluation) • List the features of academic writing and understand the concept of plagiarism • Define the characteristics of reliable sources (source criticism) • Outline cultural traits that can influence team work in a project	The student should be able to: • Apply good study techniques for time management, reading and note-taking in an intentional manner • Prepare and deliver oral presentations • Create and execute search strategies to find relevant literature • Give and receive peer-to-peer feedback and feed forward • Write a project description, project report and a process report for a semester project following the VIA Engineering guidelines.	The student should be able to: • Reflect on active learning and how take responsibility for own learning • Analyse and apply team dynamics such as communication, motivation, decision-making and conflict resolution.	Assessed on the basis of: 1. Class attendance of 80% or greater (mandatory) 2. A set of notes on 20-30 YouTube videos (mandatory) 3. A set of self-made definitions of selected terms (mandatory) 4. Written test on Project Guidelines 5. Written test on course Learning Objectives 6. Delivery of an oral presentation 7. Short-answer test on academic writing and preparation of an executive summary Re-evaluations: 4 hour written exam.
CE-STD1	Static Analysis and Load determination	5	Following completion of the course, the student has knowledge of the areas • Global stability in minor buildings. • Statical analysis and the connection between structures and static calculations. • Determine loads on minor buildings and structures. • Basic static for beams and frames.	After the completion of the course, the student must: • Be able to analyse the connection between structures and calculation based on practical examples. • Be able to apply static analysis for global stability of minor buildings. • Be able to describe transfer of forces through the structures and force-transmitting joints in small houses and minor structures. • Be able to determine loads on	After the course, the student will be able to apply knowledge and skills to the semester project, in collaboration with other students to • Perform static analysis for minor building structures. • Perform simple dimensioning by guess estimation. • Determine loads on simple structures using Eurocode EUC 0 and EUC 1, the Norm for Loads and Safety.	Prerequisites: 6 out of 7 homework assignments must be handed in and approved by the teacher. Type of examination: 4 hour written exam with an internal examiner. Allowed tools: Books, notes, examples, calculators and computers are allowed. Communication via email, internet or mobile

Code	Title	ECTS-points	Knowledge	Skills	Competences	Test
				simple structures using Eurocode EUC 0 and EUC 1, the Norm for Loads and Safety, and use the Partial Factor Method. • Be able to draw free body diagrams, set up equilibrium equations and calculate reactions for plane statically determined systems. • Be able to calculate forces in a plane truss-construction using the Joint Method and the Section Method. • Be able to identify, draw and calculate internal forces for plane beam and frame constructions. • Be able to execute simple dimensioning by guess estimation.	• Use the Partial Factor Method.	phone etc. is not allowed. The use of specialist structural design software is not allowed. Re-exam 1: 4 hour written exam (new). Re-exam 1: 20 minutes oral rexam based on assignments from courses
CE-STD2	Elastic strength of materials and Design of load bearing structures	5	Following completion of the course, the student has knowledge and understanding of • The basic principles and methods of the elastic strength of materials and deformation calculation. • Stress analysis and calculation of deformation of simple load-carrying structures.	After the completion of the course, the student must be able to: • Determine cross-section constants, second moment of area and principal axes. • Perform stress calculation in beams exposed to tension, bending, bending with normal forces, shear, biaxial bending and torsion. • Perform design calculations for simple beams and frames. • Calculate deflections using differential equations, standard formulae and superposition. • Calculate centrally loaded columns in steel. • Be able to analyse structures and see the connection between structures and calculation. • Be able to apply their knowledge of global stability in minor structures. • Be able to apply their knowledge of transfer of forces through the structures and force transmitting joints in small houses and minor structures. • Be able to apply their knowledge in order to determine loads on structures using Eurocode EUC 0 and EUC 1, and the Partial Factor Method. • Be able to apply computerized models for minor structures and test calculations on the computer using structural programs.	After the course, the student will be able to apply knowledge and skills to the semester project, in collaboration with other students to • Perform static analysis and stability calculations for minor building structures • Design minor structures in steel.	Prerequisites: Through the course, the students must solve 5 course assignments based on the knowledge and skills achieved through the course. The course assignments must be solved independently by the students and must be handed in, in original layout in WISEflow in given deadlines. All course assignments must be duly handed in order to register for exam. Type of examination: Oral exam with an external examiner. 20 minutes of examination will be based on the course assignments found by draw. Allowed tools: NA Re-exams: First resit: 20 minutes of examination will be based on the same set of course assignments where the student have the opportunity to draw again. Second resit: The student have to work out a new set of course assignments without consultations with the incoming semester and have to fallow the guidelines for examination for the incoming semester.
CE-STD3	Structural Design,	10	Science of material for concrete –	Science of material for concrete -	Science of material for concrete and	Prerequisites:

Code	Title	ECTS-points	Knowledge	Skills	Competences	Test
	Concrete structures and Soil mechanics		after the course, the student must - possess knowledge on the basic composition and structure of concrete. - possess knowledge to combine and test aggregates material for concrete - possess knowledge on the fundamentals of decomposition and damage mechanisms. Soil mechanics and geotechnical design – after completion of the course, the student must: - have knowledge about theories and methods to determine consolidation settlements and time progress. - have knowledge about initial and secondary subsidence - have knowledge about PDA-, CPT- and SPT-measurements Structural stability and connections – after completion of the course, the student must - have knowledge and understanding of the most commonly occurring load bearing structures and connections in steel - have knowledge about cross sectional capacity check for steel, elastic and plastic.	After the completion of the course, the student must: - be able to choose a relevant concrete based on demands for the durability (environmental classes) Concrete structures - After the completion of the course, the student must: - Be able to calculate concrete beam cross-sections of any shape for bending with axial force by directly application of the geometrical, physical and static conditions. - Be able to understand, account for and apply the Diagonal compression Field Method used by design of shear-reinforced beams. - Be able to design simple beam abutments. Soil mechanics and geotechnical design – after completion of the course, the student must: - Be able to calculate total-, neutral – and effective stresses - Define and establish strength parameters and deformation parameters for soil - Be able to describe the connection between geological conditions and foundation wise consequences - Calculate bearing capacity for foundations and piles. - Calculate consolidation settlements. - Draw foundation and pile plans. Structural stability and connections - After the completion of the course, the student must be able to describe, calculate and apply: - Global stability of structures. Force dispersion in columns, beams, frames, trusses and diaphragms. - Resistance of cross-sections in steel, elastic and plastic. - Moment loaded compression bars in steel. - Connections in steel structures – welding and bolts. The student must also be able to:	concrete structures - after completion of the course, the student must be able to use knowledge and skill within all subject areas to: - plan, make relevant choices of concrete materials and design simple concrete beams in the ultimate limit state in the semester project Soil mechanics and geotechnical design – after completion of the course, the student must be able to use knowledge and skills to: - Determine Geotechnical Category for any type of project - Appraise the best given solution of foundation for a project considering bearing capacity and settlements - Design foundations for buildings and constructions in ultimate limit state and estimate corresponding settlements and time progress in serviceability limit state according to Eurocodes. Structural stability and connections – after completion of the course, the student must be able to use knowledge and skill to: - construct and calculate some of the most commonly occurring load bearing structures and connections in steel - analyse and calculate stability and load transfer for more complex building structures.	All course works must be duly handed in. Course works must be uploaded to WiseFlow. Type of examination: The examination of the course is a combination of an oral exam with an internal examiner for “Structural stability and connections” and “Science of material for concrete and concrete structures” and a written test held during the semester in “Soil mechanics”. The oral exam will be 30 minutes per student in total. The exam will be based on course works solved and handed in to given deadlines during the semester. There is no preparation time before the exam. On the exam day, there will be a draw between the course works. The written test during the semester are 1,0-1,5 hours. Allowed tools: Oral exam: No tools allowed, except from the assignments uploaded to WiseFlow. Written test: It is allowed to bring notes from the lessons. Reexams: New course works will be given. Deadline for handing in is approx. 2 weeks after the course works have been given. Evaluation is performed as a combination of an oral examination based on the course works for “Structural stability and connections” and “Science of material for concrete and concrete structures” and a written test in “Soil mechanics”.

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				- Describe lateral torsional buckling in steel beams. - Use statical models to describe real bearing structures and be able to reflect and explain the effect of the applied loads on the structure. Common for all subject areas: - In all the subjects above, the student must after the course, be able to communicate clearly both orally as well as in writing, especially by being able to visualize the calculations with relevant sketches that show the applied calculation model, preconditions etc.		
CE-STD4	Computer aided structural analysis	5	After the course, the student must: - be able to apply their knowledge in the field of static analysis to develop an understanding of structural models and thereafter use specialist software to undertake computer analysis of structural problems. - acquire knowledge of various analysis techniques to enable qualitative analyses of construction models.	After the completion of the course, the student must: - Be able to accurately model statically determinate and indeterminate structures. - Be able to determine the deflections in plane frames and trusses using virtual work. - Be able to understand and use the principles of the flexibility method for use in calculations of reactions, bending moments and shear force diagrams for statically indeterminate structures. - Be able to understand and use the principles of plastic analysis for plane frames. - Be able to create two dimensional and three dimensional structural models in structural programs. - Be able to assess the quality and reliability of computer calculations. The course includes IT as a pedagogical method. The purpose is to support the students' learning processes and their understanding of the engineering opportunities, which is part of e.g. the use of modelling, simulation etc.	The student must be able to use the acquired knowledge and skills within all subject areas during the semester, to collaborate with other student, in the planning, design and performing of the subjects in the semester project. Furthermore the student must be able to solve simple design tasks during the internship at a consultant engineering company or contractor.	Prerequisites: NA Type of examination: Individual oral exam with an external examiner. Exam is without preparation and based upon course subjects. Allowed tools: All tools are allowed. Re-exam: Methods will be equal to the ordinary exam.
CE-BPR1	Bachelor Project - Start Up	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	At the successful completion of the course, students will be able to: • Extract the essence of a project and defend this clearly through oral presentation • Make effective use of feedback/feedforward from a supervisor	The course is evaluated based on: • 3 written individual course assignment • 1 written group assignment – The Project Description • Oral group presentation and defense of the Project Description Re-evaluations:

Code	Title	ECTS-points	Knowledge	Skills	Competences	Test
				• 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).	• Work efficiently and self-driven alone and in collaboration with others	Re-submission of a revised Project Description.
CE-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.	Prerequisites: Report handed in before deadline Type of examination: Group presentation followed by an individual examination with the presence of the whole group. Assessed by an external examiner. Allowed tools: All tools allowed. Re-exam: Students who failed a bachelor project have to improve the project. There will be no guidance in the period up to hand in. The project is assessed at an oral exam.
CE-BPR2 (from A23)	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.	Prerequisites: Passed all other courses of the bachelor programme. Type of exam: Oral group exam with individual assessment. The exam is based on a project report submitted before the deadline. Group presentation, 20 minutes, followed by individual examination, 20 minutes per student, in the presence of the whole group. External assessment. Allowed tools: All tools allowed. Re-exam: Based on the submitted project, the examiner gives the student guidance on necessary improvements in relation to

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						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 by an oral exam.
CE-CMP2	Project and Construction - Planning and Management	5	The student will obtain knowledge of requirements for project and construction management and planning, obtain knowledge of building projects phases, organizational and contractual relationship. The student will obtain a basic knowledge of procurement and tender legislation in Denmark, the EU, and internationally. Furthermore, the student will obtain a basic knowledge of process - and risk management.	Upon completion of the course the student should: Be able to perform planning analyses and communication strategies for stakeholder management. Possess knowledge of project phases and their contents related to contractual issues in according to the Danish AB18.Possess knowledge of a building projects contracting and subcontracting relationships. Be able to perform a tendering procedure using legislation and processes for national (Danish), and international (EU) tenders The course will thus enhance the student's ability to participate in the daily work of planning and operating within the contracting, consulting and client corporation in terms of knowledge of the juridical and legal framework and procurement. Possess knowledge of process and risk management.	Upon completion of the course, participants should be able to identify themselves with the directly involved stakeholders and be able to participate in construction management at large. After the course, the student will be able to: Analyse, argue and explain the scope of a generic building project. Compare, select and argue for an appropriate organization and procurement form and perspectives the different forms.	Prerequisites: General active participation is a prerequisite for attending the exam, documented by peer review of 80% of the assignments, conducted in class in front of the class. Each team must also act as opponent in these presentations. Type of examination: Group presentation followed by an individual examination with the presence of the whole group. Oral team examination – presentation and defense - based on a summary of presentations and completed papers answered throughout the semester. External examiner. Allowed tools: No restrictions. Re-exams: Oral individual examination - based on a summary of presentations and completed papers answered throughout the semester.
CE-SEP6	Semester Project 6th semester	10	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 - Apply information and computational technology tools to the project - If relevant, make financial estimates for the project/solution. - Present all relevant information in report and appendix, using references and sources of information correctly.	After the completion of the project work, the students must be able to: • Analyse a given (chosen) problem within the specialization, collect data, select appropriate methods of analysis, put the result into perspective and conclude. • Plan and carry out the project and related activities according to self-defined time schedule	Prerequisites: Course assignments handed in before deadline. Type of examination: Group presentation followed by an individual examination with the presence of the whole group. Assessed by an external examiner. Allowed tools: All tools allowed Re-exam: Students who failed a semester project have to improve the project. There will be no guidance in the period up to hand in. The project is assessed at an oral exam.

Code	Title	ECTS-points	Knowledge	Skills	Competences	Test
				- Extract the essence of the project and communicate this clearly orally and in writing.		
CE-CMP3	Contractors Financial Management	5	After completion of the course, the student must have knowledge about: – Company economy – Project economy – Cash flow – Accounts	After the course, participants should: – Understand how the economic systems work in a construction company. – Have knowledge of a construction company's economic conditions - including liability and risk - and have a thorough understanding of payment systems. – Be able to conduct a project cash flow. – Understand the application of LEAN Construction.	Upon completion of the course, participants should: – Be able to assist in economic and managerial aspects in a construction company – Be able to conduct a company´s project work. – Be able to analyse, argue, and explain the scope of a construction company's economy. – Be able to compare, select and argue for an appropriate way of calculating direct and indirect costs, risk and margin. - Be able to assist in an organization managed by LEAN Construction principles.	Prerequisites: General active participation in class. Teams must conduct presentations of the assignments in class. Each team must also act as opponent in these presentations. Type of examination: Students are graded based on course assignments carried out during the course. 5 sets that each provide 20% of the final grade. Allowed tools: All tools allowed. Re-exams: Individual oral exam with an internal examiner. Exam is without preparation based upon a subject found by draw (not course assignments).
CE-CMP3 (from A23)	Contractors Financial Management	5	After completion of the course, the student must have knowledge about: – Company economy – Project economy – Cash flow – Accounts	After the course, participants should: – Understand how the economic systems work in a construction company. – Have knowledge of a construction company's economic conditions - including liability and risk - and have a thorough understanding of payment systems. – Be able to conduct a project cash flow. – Understand the application of LEAN Construction.	Upon completion of the course, participants should: – Be able to assist in economic and managerial aspects in a construction company – Be able to conduct a company´s project work. – Be able to analyse, argue, and explain the scope of a construction company's economy. – Be able to compare, select and argue for an appropriate way of calculating direct and indirect costs, risk and margin. - Be able to assist in an organization managed by LEAN Construction principles.	Prerequisites: None Type of exam: Ongoing assessment in the form of four written assignments and an exam in the form of a written assignment. Each weighing 20% . Internal assessment. Allowed tools: All tools allowed. Re-exams: Individual oral exam with internal assessment. Exam is without preparation based upon a subject found by draw (not course assignments).
CE-ELM1	Element Building – Concrete Statics	5	After completion of the course, the student must: – have knowledge about statics used for prefabricated concrete element building with the goal of implementing the design of concrete element buildings. – Obtain knowledge on commonly used joints.	After the completion of the course, the student must: – Be able to complete a building structural model comprehend the corresponding calculation model. – Be able to determine the horizontal transfer of forces to walls in a statically determinate and a statically indeterminate wall structure, using elastic or plastic distribution of	After completion of the course, the student must be able to use knowledge and skill within all subject areas to plan and make relevant choices of techniques and theories in order to solve structural design project.	Prerequisites: In order to register for exam, ALL course assignments must be handed in on WiseFlow during the semester. At least 80% of the assignments must be handed in before a given deadline in order to register for the exam. Type of examination: Oral Exam with an external examiner.

Code	Title	ECTS-points	Knowledge	Skills	Competences	Test
				forces. – Be able to understand and use the effective design concrete compressive strength used in plastic design of concrete structures – Be able to explain the principles of the strut and tie model and to solve simple tasks using it. – Be able to use the Stringer method in the calculation of walls and diaphragms. – Be able to complete stability calculations of walls both for one storey buildings and multiple storey buildings. – Be able to calculate the strength of shear walls (Strut and tie model, the Stringer method and vertical load bearing resistance). – Gain an understanding of casting joints and be able to calculate these in accordance to DS/EN 1992-1-1. – Be able to calculate some of the commonly used joints.		25 minutes per student in total incl. grading. The exam will be based on course assignments solved and handed in to given deadlines during the semester. The student must bring all the assignments on paper for the exam. There is no preparation time before the exam. On the exam day, there will be a draw between the subjects covered by the course assignments. Several course assignment may enter into the drawn subject. Re-exams: Evaluation is performed as an oral examination using the same method as the ordinary exam.
CE-FEM1	Finite Element Method for Frame and Plate Structures	5	After completion of the course, the students must: – Have knowledge about theory that covers basic aspects of matrix mechanics including stiffness relations for 2D-beam elements. The theory will be accompanied by MATLAB exercises and followed up by applications on steel, concrete and timber structures using the commercial STAAD PRO software package.	After the completion of the course, the student must: – Transform a conventional structural model into a model appropriate for FE-treatment. – Adopt the procedures of commercial finite element programs in general and the STAAD PRO software in particular.	After completion of the course, the student must be able to use knowledge and skill within all subject areas to plan and make relevant choices of techniques and theories in order to solve structural design project.	Prerequisites: 100% of the criteria below must be met. Type of examination: The assessment is based on the following criteria. 1. All home assignments must be handed in on time and be approved. (20%) 2. The mini-project must be presented and the technical documentation must be handed in no later than the day of presentation. The mini-project must be approved as a hole. (80%) Allowed tools: Not applicable Re-exams:
CE-FEM1 (from A23)	Finite Element Method for Frame and Plate Structures	5	After completion of the course, the students must: – Have knowledge about theory that covers basic aspects of matrix mechanics including stiffness relations for 2D-beam elements. The theory will be accompanied by MATLAB exercises and followed up by applications on steel, concrete and timber structures using the commercial STAAD PRO software	After the completion of the course, the student must: – Transform a conventional structural model into a model appropriate for FE-treatment. – Adopt the procedures of commercial finite element programs in general and the STAAD PRO software in particular.	After completion of the course, the student must be able to use knowledge and skill within all subject areas to plan and make relevant choices of techniques and theories in order to solve structural design project.	Prerequisites: None Type of exam: Ongoing tests in the form of one written assignment, weighing 20% An oral exam, weighing 80%. The oral exam is based on a written mini project, handed in before deadline. Internal assessment.

Code	Title	ECTS-points	Knowledge	Skills	Competences	Test
			package.			Allowed tools: Not applicable Re-exams: Oral exam similar to the ordinary exam.
CE-GEO1	Deep Excavations in Urban Areas	5	After completion of the course, the student will have knowledge of: Execution of deep excavations and construction pits The main characteristics and risks connected to different types of retaining walls. One- and two-dimensional ground water flow. Calculation of gradient, critical gradient and the risk of base failure. Different methods for ground water lowering	After completion of the course, the student will have the skills to: Compare the suitability of different types of retaining walls. Calculate the critical gradient and check for risk of base failure. Calculate the influence of flowing ground water on earth- and water pressure on retaining structures. Perform calculations on the drawdown for ground water lowering in confined and unconfined ground water aquifers	After the course, the student will be able to apply knowledge and skills to: Discuss the suitability of different types of retaining walls in urban applications for most soil and ground water conditions. Evaluate risks of constructing deep excavations. Design and plan simple ground water lowering systems. Evaluate the influence of ground water on excavations and retaining walls	Prerequisites: All Course Works must be handed in and approved. Type of examination: Oral examination with an external examiner. Allowed tools: Personal notes Re-exams: Oral exams.
CE-GEO2	Geotechnical design	5	Following completion of the course, the student has knowledge of: – Risk of punch through for foundations on thin soil layers – Plane pile works / piles in groups – Methods for strengthening of soil	After completion of the course, the student must have the skills to: – Calculate the bearing capacity of a soil layer placed at a limited depth below the foundation – Calculate the bearing capacity of piles in groups – Examine the stability of slopes – Determine the best suitable method for strengthening soil	After the course, the student will be able to apply knowledge and skills to: – Design ground anchors – Design of anchor plates and anchor length to ensure total stability – Design of steel in excavation pits – Evaluate the need for strengthening the soil	Prerequisites: None Type of examination: Individual oral exam with an internal examiner. The oral exam will be 20 minutes. Allowed tools: Personal notes Re-exams: 20 minutes oral exam with an internal examiner.
CE-GEO2 (from A23)	Geotechnical design	5	Following completion of the course, the student has knowledge of: – Risk of punch through for foundations on thin soil layers – Plane pile works / piles in groups – Methods for strengthening of soil	After completion of the course, the student must have the skills to: – Calculate the bearing capacity of a soil layer placed at a limited depth below the foundation – Calculate the bearing capacity of piles in groups – Examine the stability of slopes – Determine the best suitable method for strengthening soil	After the course, the student will be able to apply knowledge and skills to: – Design ground anchors – Design of anchor plates and anchor length to ensure total stability – Design of steel in excavation pits – Evaluate the need for strengthening the soil	Prerequisites: None Type of examination: Ongoing tests in the form of four written assignments, each weighing 20%, and an exam in the form of a test, weighing 20%. Internal assessment. Allowed tools: N/A Re-exams: Same as the ordinary (new assignments). Third attempt is an oral exam without preparation based on subject found by draw.
CE-GEO3	Advanced Geotechnical Design	5	Following completion of the course, the student has knowledge of: – Parameter and sensitivity analysis – Serviceability limit state design of geotechnical structures	After completion of the course, the student must have the skills to: – Design retaining walls with more anchor levels/support levels in ultimate limit state and serviceability	After the course, the student will be able to apply knowledge and skills to: – Design retaining walls with more anchor levels (Ultimate limit state)	Prerequisites: None Type of examination: A grade is given based on course

Code	Title	ECTS-points	Knowledge	Skills	Competences	Test
			– Retaining walls with more anchor levels – The content of a geotechnical design report – Risk assessment in relation to e.g. CSM procedure – Inclinometer measurements	limit state – Examine the serviceability limit state for excavations – Perform a parameter and sensitivity analysis to determine the effect on the design – Perform calculations in e.g. Plaxis	and evaluate the deformations (serviceability limit state) according to Eurocodes. – Report the design in a geotechnical design report – Evaluate the results from the parameter and sensitivity analysis in order to select the parameters for the calculations – Critically evaluate the results from e.g. Plaxis calculations	assignments and tests. Course assignments counts 80% of the final grade and tests counts 20%. Allowed tools: Not applicable Re-exams: If failing the course (1st try), the student is provided with a new case study. If failing the 2nd attempt, the student has to attend an oral examination (3rd try). The oral examination is without preparation based upon a subject found by draw.
CE-INE1	Indoor Environment	5	Following completion of the course, the student can: Explain the indoor environmental parameters and impact on human health and comfort, that includes: thermal, atmospheric, acoustic, visual and mechanical indoor climate. Describe the impact of the physical indoor environment on human work performance. Identify relevant legislation and standards for Indoor Environment. Observe and describe building installations that influence the indoor climate	Following completion of the course, the student can: Calculate and illustrate the thermal, atmospheric and visual indoor climate. Use software tools to simulate and document the indoor environment with focus on thermal and atmospheric indoor climate. Apply existing codes, standards, and guidelines for the indoor environment. Plan measurements and surveys of indoor climate and use instruments to measure relevant parameters in one selected work environment.	Following completion of the course, the student can: Select and analyse relevant indoor environment design criteria's for a specific work environment for planning of ventilation system. Interpret relevant legislation, standards and executive orders. Plan and execute simple indoor climate field surveys and analyse and evaluate the results Carry out a project in groups and present the work in a report and in an oral presentation	Prerequisites: NA Type of examination: Ongoing assessment of 3 written individual/group assignments, weighing 10% each, and a final exam consisting of a written group course assignment, weighing 70% Internal assessment Allowed tools: NA Re-exam: Oral re-exam, 15 mins, with an internal examiner. Individual presentation of final course assignment and draw of a question in the full course content.
CE-INF3	Basic Railway and Light rail - Planning and Design	5	After completion of the course, the student must have the overall knowledge on key elements of railways and light rails.	After completion of the course, the student must have the skills to: • Explain and execute the geometrical design of an open line • Design of intersections with light rails.	After completion of this course, the student must have the competences to: • Explain the infrastructure elements of railways and light rail • Describe elements in horizontal and vertical alignments • Describe elements in a typical ballast track cross section • Propose relevant designs of horizontal alignments, as well as, cross sections for an open line and a station • Explain the gauge structure and fouling point • Explain the terms cant excess, cant deficiency and ideal cant and describe how they are determined • Propose a speed profile for a track alignment	Prerequisites: None Type of examination: Students are graded based on course assignments (50%) and tests (50%) carried out during the course. Allowed tools: Not applicable Re-exams: Individual oral exam with an internal examiner. Exam is without preparation based upon a subject found by draw. Any third exam is an individual oral exam with an internal examiner. Exam is without preparation based upon a subject found by draw, similar to the first re-exam.

Code	Title	ECTS-points	Knowledge	Skills	Competences	Test
					• Calculate the running time of a train • Propose and evaluate timetables for a railway section • Explain the use of track engineering rules (requested-, standard and exceptional regulations) and railway norms (BN1-, BN2- and BN3-regulations), and define design criteria based on these.	
CE-INF3 (from A23)	Basic Railway and Light rail - Planning and Design	5	After completion of the course, the student must have the overall knowledge on key elements of railways and light rails.	After completion of the course, the student must have the skills to: • Explain and execute the geometrical design of an open line • Design of intersections with light rails.	After completion of this course, the student must have the competences to: • Explain the infrastructure elements of railways and light rail • Describe elements in horizontal and vertical alignments • Describe elements in a typical ballast track cross section • Propose relevant designs of horizontal alignments, as well as, cross sections for an open line and a station • Explain the gauge structure and fouling point • Explain the terms cant excess, cant deficiency and ideal cant and describe how they are determined • Propose a speed profile for a track alignment • Calculate the running time of a train • Propose and evaluate timetables for a railway section • Explain the use of track engineering rules (requested-, standard and exceptional regulations) and railway norms (BN1-, BN2- and BN3-regulations), and define design criteria based on these.	Prerequisites: None Type of examination: Ongoing tests in the form of 3 written individual/ group assignments and an individual written test, weighing 15%, 15% and 20% respectively, and an individual written exam, weighing 50%. Internal assessment Allowed tools: Not applicable Re-exams: Individual oral exam with an internal examiner. Exam is without preparation based upon a subject found by draw. Any third exam is an individual oral exam with an internal examiner. Exam is without preparation based upon a subject found by draw, similar to the first re-exam.
CE-INF4	Traffic Safety & Planning and Design of Roundabouts	5	After completion of the course, the student must have the overall knowledge on key elements of roundabouts and use of these in an urban environment.	After completion of the course, the student must have the skills to plan and design the geometry of roundabouts in urban areas. Furthermore, the student must have the skills to evaluate and apply traffic safety measures in the project. After the completion of the course, the student must: Understand the characteristics and needs of the different road users in city and urban areas.	After completion of this course, the student must have the competences to: Analyse the capacity in a roundabout. Propose relevant designs of roundabouts – horizontal and vertical geometry, as well as, cross-sections. Use CAD software for design of roundabouts. Design traffic solutions where the characteristics of the different road users are incorporated. Evaluate drainage principles and	Prerequisites: None Type of examination: Students are graded based on course assignments (50%) and tests (50%) carried out during the course. Allowed tools: Not applicable Re-exams: Individual oral exam without preparation

Code	Title	ECTS-points	Knowledge	Skills	Competences	Test
				Analyse and understand different situations and designs with the purpose of identifying potential traffic safety problems. Handle and document traffic safety issues in own designs and to come up with solutions and ideas on how to improve on existing designs	carry out drainage controls in own design. Propose materials and pavements for a roundabout. Evaluate and plan traffic flow during construction works. Analyse traffic safety measures in new and existing designs	based upon a subject found by draw. Any second resit is an individual oral exam without preparation based upon a subject found by draw, similar to the first re-exam.
CE-INF5	Infrastructure – Planning, Design and Maintenance of Road Projects in Urban Areas	5	After completion of the course, the student must have the knowledge of: • Workflows and roles of stakeholders involved in urban infrastructure projects, from initial ideas to operation and maintenance • Project documentation for urban infrastructure projects in preliminary design phase • Project documentation for urban infrastructure projects in detail design phase • Project documentation for urban infrastructure projects in tender phase • Project documentation for urban infrastructure projects in operation and maintenance phase	After completion of the course, the student must have the skills to: • Identify which stakeholders are involved in an urban infrastructure project at each project phases • Describe the roles of stakeholders involved in an urban infrastructure project at each project phases • Plan and design urban infrastructure projects, such as parking spaces and traffic terminals and speed reducers	After completion of this course, the student must have the competences to: • Manage a simple road infrastructure project in urban areas from initial ideas to operation and maintenance phase	Prerequisites: None Type of examination: A grade is given based on course assignments and tests. Four course assignments counts 60% of the final grade and tests counts 40%. Allowed tools: Not applicable Re-exams: Individual oral exam without preparation based upon a subject found by draw. Any second resit is an individual oral exam without preparation based upon a subject found by draw, similar to the first re-exam.
CE-INF5 (from A23)	Infrastructure – Planning, Design and Maintenance of Road Projects in Urban Areas	5	After completion of the course, the student must have the knowledge of: • Workflows and roles of stakeholders involved in urban infrastructure projects, from initial ideas to operation and maintenance • Project documentation for urban infrastructure projects in preliminary design phase • Project documentation for urban infrastructure projects in detail design phase • Project documentation for urban infrastructure projects in tender phase • Project documentation for urban infrastructure projects in operation and maintenance phase	After completion of the course, the student must have the skills to: • Identify which stakeholders are involved in an urban infrastructure project at each project phases • Describe the roles of stakeholders involved in an urban infrastructure project at each project phases • Plan and design urban infrastructure projects, such as parking spaces and traffic terminals and speed reducers	After completion of this course, the student must have the competences to: • Manage a simple road infrastructure project in urban areas from initial ideas to operation and maintenance phase	Prerequisites: None Type of examination: Ongoing tests in the form of four written individual/group assignments, each weighing 15% and an exam in the form of a written test, weighing 40%. Internal assessment Allowed tools: Not applicable Re-exams: Individual oral exam without preparation based upon a subject found by draw. Any second resit is an individual oral exam without preparation based upon a subject found by draw, similar to the first re-exam.
CE-MAS1	Masonry Structures	5	After the course, the student should have knowledge about using of masonry structures in common buildings. After completion of the course, the students must: - have knowledge about fundamental material properties of masonry	After the course, the student must be able to: - determine material properties of masonry structures - design of masonry walls subjected to vertical and horizontal loads - design of lintels - design of wall ties	After completion of the course, the student must be able to use knowledge and skill within all subject areas to plan and make relevant choices of techniques and theories in order to solve masonry structural design project and choose suitable fire protection for common structural	Prerequisites: None Type of examination: Individual oral exam with internal assessment, 25 min. The exam is based upon a subject found by draw, and with no preparation.

Code	Title	ECTS-points	Knowledge	Skills	Competences	Test
			- have basic knowledge about stress analysis and calculation of deformation of simple load-bearing masonry structures.	- describe movement joints, shear walls, reinforced masonry and steel columns in masonry structures. - Evaluate the execution of masonry structures	elements.	Allowed tools: No tools allowed. Re-exams: Conducted as the ordinary exam.
CE-STU1	Steel Structures	5	After completion of the course, the students must: – Have knowledge about different types of steel structures (e.g. industrial buildings, hangars). – Have knowledge about the principles for calculation of plate elements with stiffeners and be able to calculate a chosen few. – Have knowledge about the resistance of transverse forces (design resistance of webs in plate girders). – Have knowledge about flange induced web buckling. – Have basic knowledge of fire design for structural steel. – Have knowledge of various steel connection types. – Have a basic understanding of load transfer in steel connections.	After completion of the course, the students must: – Be able to model globally stable structural steel systems. – Be able to calculate buckling of plates, eg. in welded plate girders. – Be able to calculate cross sections in class 4 using the effective cross section in the ultimate limit state. – Be able to calculate a plate girder with respect to lateral torsional buckling. – Analysis of bracing systems which are required to provide lateral stability of beams and compression members (eg. columns). – Be able to calculate restraint in structural parts subject to compression. – Be able to analyse/calculate some chosen structural steel connections (eg. welded connections in portal frames, design tension resistance of a T-stub flanges in plate girders).	After completion of the course, the student must be able to use knowledge and skill within all subject areas to plan and make relevant choices of techniques and theories in order to solve structural design project.	Prerequisites: All course assignments must be duly handed in in order to register for exam. Course assignments must be uploaded to Itslearing during the semester and to WISEflow at give deadlines. Type of examination: Oral Exam with an external examiner. 20 minutes per student in total incl. grading. The exam will be based on course assignments solved and handed in to given deadlines during the semester. There is no preparation time before the exam. On the exam day, there will be a draw between the subjects covered by the course assignments. Several course assignment may enter into the drawn subject. Allowed tools: It is allowed to bring the assignments to the examination. Re-exams: Oral exam using the same method as the ordinary exam.
CE-STU1 (from A23)	Steel Structures	5	After completion of the course, the students must: – Have knowledge about different types of steel structures (e.g. industrial buildings, hangars). – Have knowledge about the principles for calculation of plate elements with stiffeners and be able to calculate a chosen few. – Have knowledge about the resistance of transverse forces (design resistance of webs in plate girders). – Have knowledge about flange induced web buckling. – Have basic knowledge of fire design for structural steel. – Have knowledge of various steel connection types. – Have a basic understanding of	After completion of the course, the students must: – Be able to model globally stable structural steel systems. – Be able to calculate buckling of plates, eg. in welded plate girders. – Be able to calculate cross sections in class 4 using the effective cross section in the ultimate limit state. – Be able to calculate a plate girder with respect to lateral torsional buckling. – Analysis of bracing systems which are required to provide lateral stability of beams and compression members (eg. columns). – Be able to calculate restraint in structural parts subject to compression. – Be able to analyse/calculate some	After completion of the course, the student must be able to use knowledge and skill within all subject areas to plan and make relevant choices of techniques and theories in order to solve structural design project.	Exam prerequisites: Eight out of ten course assignments must be handed in and approved. If the exam prerequisite is not met, the student must submit new course papers within the same subject to qualify for the re-exam. Type of exam: Oral exam, 25 minutes incl. grading. Internal assessment. Tools allowed: None Re-exams: Same as the ordinary exam.

Code	Title	ECTS-points	Knowledge	Skills	Competences	Test
			load transfer in steel connections.	chosen structural steel connections (eg. welded connections in portal frames, design tension resistance of a T-stub flanges in plate girders).		
CE-SUB1	Sustainable Buildings	5	The students will gain knowledge about the concept of sustainable buildings.	After completion of the course, the student must be able to: Define sustainability i.e. relate to and apply sustainable concepts and understand The UN Sustainable Development Goals - 17 SDG´s Understand and apply the concept of sustainable assessment tools, with focus on DGNB and introduction to LEED Understand and work with the importance of early teamwork in the planning process between developer, architect and engineer – Integrated design process IDP. Design and analyse a building with respect of the concept of Integrated Energy Design. .Calculate, analyse and evaluate the Energy performance Framework with passive and active techniques. Acquire knowledge and understanding of indoor environmental climate in buildings, i.e. simple analyse of daylight. Implement methods of LCA and Cradle to Cradle concept.	Following completion of the course, the student can: Relate Engineering competences to the UN Sustainable Development Goals - 17 SDG´s – role and responsibilities. Assess the sustainable assessment method DGNB by screening the overall performance of the build environment. Evaluate in depth selected DGNB credits with respect of: Integrated Energy Design IED/Integrated design process IDP Sustainable building materials. Energy performance framework Indoor climate, daylight calculation Life Cycle Assessment (LCA)	Prerequisites: NA Type of examination: Ongoing assessment of 3 written individual/group assignments, weighing 10% each, and a final exam consisting of a written group course assignment, weighing 70% Internal assessment Allowed tools: NA Re-exam: Oral re-exam, 15 mins, with an internal examiner. Individual presentation of final course assignment and draw of a question in the full course content.
CE-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 of 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 rain water locally. • Reuse of rain water. • Green roofs. • Infiltration basins. • 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.	Prerequisites: None Type of examination: Assessed on basis of the following criteria: • Given assignments/reports, which must be handed in on time. 30% of the grade • Major course exercise, which must be handed in on time. 70% of the grade. Allowed tools: Not applicable Re-exam:
CE-SUD1 From A23	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 of 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 rain water locally.	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.	Prerequisites: None Type of exam: Ongoing tests in the form of two written assignments, each weighing 15%, and an exam consisting of a larger written

Code	Title	ECTS-points	Knowledge	Skills	Competences	Test
				• Reuse of rain water. • Green roofs. • Infiltration basins. • Open channels • Use of Scalgo		assignment weighing 70% Internal assessment Allowed tools: Not applicable Re-exam: Individual oral exam, 25 minutes.
CE-TIM1	Timber Structures	5	After completion of the course, the students must: – have knowledge about fundamental properties of materials in Timber. – have basic knowledge about Stress analysis and calculation of deformation of simple load-bearing structures. – have knowledge and understanding of the most complex load bearing structures and connections in timber.	After completion of the course, the students must: • have gained an understanding of Timber structure and physical properties. • be able to apply their knowledge in order to carry out stress analysis and calculation of deformation of simple load-bearing structures in timber beams and centrally loaded timber columns. • be able to describe materials of Timber based panels Also they must be able to describe, calculate and apply: • Moment loaded compression bars in timber. • Lateral torsional buckling in timber beams. • Connections in timber structures – nails and bolts. • tension/compression bars • tapered beams. • trusses and glued thin-flanged beams. • fire resistance calculation. • Diaphragms in timber structures.	After completion of the course, the student must be able to use knowledge and skills within all subject areas to plan and make relevant choices of techniques and theories in order to solve structural design project. The students must also be able to perform laboratory experiments and associated reports (laboratory exercises are conducted as a workshop courses).	Prerequisites: The exam will be based on course assignments solved and handed in to given deadlines during the semester. In order to register for exam, all course assignments must be duly handed in. Course assignments must be uploaded to WISEflow. Type of examination: Oral Exam with an External examiner. 20 minutes per student in total. There is no preparation time before the exam On the exam day, there will be a draw between the course assignments. Allowed tools: It is allowed to bring the assignments to the examination. Re-exam: New course assignments can be given. Deadline for handing in is approx. 2 weeks after the course assignments have been given. Evaluation is performed as an oral examination.
CE-TIM1 (from A23)	Timber Structures	5	After completion of the course, the students must: – have knowledge about fundamental properties of materials in Timber. – have basic knowledge about Stress analysis and calculation of deformation of simple load-bearing structures. – have knowledge and understanding of the most complex load bearing structures and connections in timber. - have knowledge about CO2 Emission from wood.	After completion of the course, the students must: • have gained an understanding of Timber structure and physical properties. • be able to apply their knowledge in order to carry out stress analysis and calculation of deformation of simple load-bearing structures in timber beams and centrally loaded timber columns. • be able to describe materials of Timber based panels Also they must be able to describe, calculate and apply: • Moment loaded compression bars in timber. • Lateral torsional buckling in timber	After completion of the course, the student must be able to use knowledge and skills within all subject areas to plan and make relevant choices of techniques and theories in order to solve structural design project. The students must also be able to perform laboratory experiments and associated reports (laboratory exercises are conducted as a workshop courses).	Exam prerequisites: Four out of five course assignments must be handed in and approved. If the exam prerequisite is not met, the student must submit new course papers within the same subject to qualify for the re-exam. Type of exam: Oral exam, 25 minutes incl. grading. Internal assessment. Tools allowed: None Re-exams: Same as the ordinary exam.

Code	Title	ECTS-points	Knowledge	Skills	Competences	Test
				beams. • Connections in timber structures – nails and bolts. • tension/compression bars • tapered beams. • trusses and glued thin-flanged beams. • fire resistance calculation. • Diaphragms in timber structures. • Be able to calculate CO2 emission from wood to help with comparison.		
CE-VEN1	Ventilation Systems	5	Following completion of the course, the student can: - Identify and explain the indoor climate parameters and their impact on the ventilation and management and thereby the building´s energy demand. - Account for the Building Regulations requirements for building energy demand, indoor climate and building services. - Account for different principles of ventilation (natural, hybrid and mechanical ventilation). - Calculate and choose different component in a ventilation system, including heating/cooling coils, filters and ventilation units. - Identify different controlling strategies for a ventilation system.	Following completion of the course, the student can: - Carry out a justified choice of ventilation principle and automation system based on the function demand. - Design a ventilation system with the necessary components based on the required performance. - Optimize and adjust a ventilation system regarding the required airflow and energy efficiency. - Conduct a sound analyse of a ventilation system and reduce it according to the demand. - Account for BIM and the application of 3D design of a ventilation system.	Following completion of the course, the student can: - Detailed design of ventilation in buildings - Distribution of air in rooms and design of diffusers. - Air treatment processes and Mollier diagram. - Calculation of ducts and design of the air distribution system. - Design of ventilation components (Fans, Heat exchangers, Pumps and Engines). - Estimation of sound in ventilation systems and calculation of attenuators. - Calculation of energy consumption and heat recovery efficiency. - Understand the different ventilation automation and control systems. - Bips work specification tool for ventilation and building automation. - Knowledge of calculation methodology of natural ventilation in buildings.	Prerequisites: NA Type of examination: The course will be evaluated based on: •Written group assignment handed in at the end of the course •Oral group presentation of the group assignment •2 Individual written assignment during the course. Grading based on the Danish 7-point scale. Individual assignments account for 30 % of final grade Group assignment and oral presentation together account for 70 % of final grade Allowed tools: All Re-exam: Written individual assignment. Internal assessment
CE-VEN1 (from A23)	Ventilation Systems	5	Following completion of the course, the student can: - Identify and explain the indoor climate parameters and their impact on the ventilation and management and thereby the building´s energy demand. - Account for the Building Regulations requirements for building energy demand, indoor climate and building services. - Account for different principles of ventilation (natural, hybrid and mechanical ventilation). - Calculate and choose different component in a ventilation system, including heating/cooling coils, filters	Following completion of the course, the student can: - Carry out a justified choice of ventilation principle and automation system based on the function demand. - Design a ventilation system with the necessary components based on the required performance. - Optimize and adjust a ventilation system regarding the required airflow and energy efficiency. - Conduct a sound analyse of a ventilation system and reduce it according to the demand. - Account for BIM and the application of 3D design of a ventilation system.	Following completion of the course, the student can: - Detailed design of ventilation in buildings - Distribution of air in rooms and design of diffusers. - Air treatment processes and Mollier diagram. - Calculation of ducts and design of the air distribution system. - Design of ventilation components (Fans, Heat exchangers, Pumps and Engines). - Estimation of sound in ventilation systems and calculation of attenuators. - Calculation of energy consumption	Prerequisites: None Type of exam: Ongoing assessment in the form of two written individual course assignments, each weighing 15% and a group assignment followed by an oral group exam, 10 minutes per student, weighing 70%. Internal assessment. Allowed tools: All Re-exam: Written individual assignment. Internal assessment

Code	Title	ECTS-points	Knowledge	Skills	Competences	Test
			and ventilation units. - Identify different controlling strategies for a ventilation system.		and heat recovery efficiency. - Understand the different ventilation automation and control systems. - Bips work specification tool for ventilation and building automation. - Knowledge of calculation methodology of natural ventilation in buildings.	
SE-LCA1	Circular Economy and LCA	5	Students completing this course will be familiar with: - The international guidelines for LCA analyses (ISO standards 14040 and 14044) - The step-by-step working process that must be followed when carrying out an LCA analysis - The principles behind defining functional units, system boundaries and time scopes for LCA analyses - Chosen data sources providing data for LCI´s and LCIA´s - Different environmental impact categories - The common way to graphically present end results of LCA analyses - The origin and concept of CE and how it differs from the current linear system - How the UN system influences global development within CE - The UN SGDs	Students completing this course will be able to: - Define functional units, system boundaries and time scopes for LCA analyses according to the international guidelines (ISO standards 14040 and 14044) - Carry out LCA analyses for simple production or service system scenarios according to the international guidelines (ISO standards 14040 and 14044) - Compare competing production or service systems on the basis of an LCA analysis - Present and interpret results of LCA analyses and discuss these in relation to decision making - Search for and identify relevant data for Life Cycle Inventories (LCI) - Prepare simple Life Cycle Inventories (LCI) and carry out Life Cycle Impact Assessments (LCIA) based on these, according to the international guidelines (ISO standards 14040 and 14044) - Graphically present the end results of LCA analyses and explain how these are related to the former steps of the analyses - Identify barriers to change of CE development - Identify opportunities for CE business development - Formulate individual change of behavior to promote CE - Evaluate business cases in relation to fulfilling the SGD - Promote circular economy as an innovation tool for companies	Students completing this course will be able to: - Define comparable scenarios for competing production/service systems in order to analyze the respective environmental impacts of these - Discuss the effect and importance of relevant environmental impacts of different (but comparable) scenarios in relation to the environmental and social circumstances under which the scenarios are present - Relate results from LCA analyses with the ideas of CE to suggest sustainable choices in given situations - Discuss how working towards fulfilling the SGDs requires individual as well as a political change of behavior	Prerequisites: Mandatory course activities completed. Mandatory assignments handed in before deadline and accepted. Type of examination: A case based written exam with internal examiner. Allowed tools: Re-exam: Not passing the course - a new course assignment will be given, to be accepted and evaluated in equal manner as within the course.
SE-LCA1 (from A23)	Circular Economy and LCA	5	Students completing this course will be familiar with: - The international guidelines for LCA analyses (ISO standards 14040 and 14044)	Students completing this course will be able to: - Define functional units, system boundaries and time scopes for LCA analyses according to the	Students completing this course will be able to: - Define comparable scenarios for competing production/service systems in order to analyze the	Exam prerequisites: None Type of exam: A case based written exam, 48 hours.

Code	Title	ECTS-points	Knowledge	Skills	Competences	Test
			- The step-by-step working process that must be followed when carrying out an LCA analysis - The principles behind defining functional units, system boundaries and time scopes for LCA analyses - Chosen data sources providing data for LCI´s and LCIA´s - Different environmental impact categories - The common way to graphically present end results of LCA analyses - The origin and concept of CE and how it differs from the current linear system - How the UN system influences global development within CE - The UN SGDs	international guidelines (ISO standards 14040 and 14044) - Carry out LCA analyses for simple production or service system scenarios according to the international guidelines (ISO standards 14040 and 14044) - Compare competing production or service systems on the basis of an LCA analysis - Present and interpret results of LCA analyses and discuss these in relation to decision making - Search for and identify relevant data for Life Cycle Inventories (LCI) - Prepare simple Life Cycle Inventories (LCI) and carry out Life Cycle Impact Assessments (LCIA) based on these, according to the international guidelines (ISO standards 14040 and 14044) - Graphically present the end results of LCA analyses and explain how these are related to the former steps of the analyses - Identify barriers to change of CE development - Identify opportunities for CE business development - Formulate individual change of behavior to promote CE - Evaluate business cases in relation to fulfilling the SGD - Promote circular economy as an innovation tool for companies	respective environmental impacts of these - Discuss the effect and importance of relevant environmental impacts of different (but comparable) scenarios in relation to the environmental and social circumstances under which the scenarios are present - Relate results from LCA analyses with the ideas of CE to suggest sustainable choices in given situations - Discuss how working towards fulfilling the SGDs requires individual as well as a political change of behavior	Internal assessment. Tools allowed: All Re-exam: Same as the ordinary exam, with new assignment, or re-exam may be oral, 20 minutes.
SE-STS1	Geothermal Systems	se5	The student will gain knowledge about geothermal systems as a sustainable energy source and 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		Prerequisites: All course assignments approved. Type of examination: Oral exam with an internal examiner. Allowed tools: None. Re-exam: Method will be equal to the ordinary exam.

Code	Title	ECTS-points	Knowledge	Skills	Competences	Test
				heating and cooling.		
SE-STS1 (from A23)	Geothermal Systems	se5	The student will gain knowledge about geothermal systems as a sustainable energy source and 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.		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.
SE-TER1	Thernodynamics and Particle Dynamicx	5	The students will get knowledge about: The basis of thermodynamics, ideal gases and reversible processes, the second law of thermodynamics and entropy, real substances, steam power plants, refrigeration and heat pumps systems, heat transfer/heat exchangers. Kinematics of a particle and kinetics of a particle, steady flow of a fluid stream and work and energy.	After completing the course the student will be able to: Analyze a particle dynamic system and/or a simple thermodynamic system and identify and select relevant theory so the student is able to perform serial mathematical calculations on variables and main capacities for the system. Solve simple technical problems on the basis of fundamental calculus and dynamic or thermodynamic laws. Follow simple procedures with different techniques of stating and solving dynamic or thermodynamic problems. 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: Identify which parts of the acquired knowledge and skills that´s relevant to a given simple real-world particle dynamic or thermodynamic problem. Relate the acquired knowledge and skills to create simple mathematical models of real-world particle dynamic or thermodynamic problems. Use their acquired skills and knowledge to study more Dynamics and Thermodynamic courses on the Supply Engineering education. Use a commercial mathematical and other software to solve and perform serial technical calculations.	Prerequisites: Upload in WiseFlow of selected course assignments solved during course, approximately one week before the oral exam. Type of examination: Individual oral examination without preparation based upon course assignment(s) found by draw. Duration: 20 min. Internal examiner. Allowed tools: None Re-exam: Method will be equal to the ordinary exam.
SE-TER1 (from A23)	Thernodynamics and Particle Dynamicx	5	The students will get knowledge about: The basis of thermodynamics, ideal gases and reversible processes, the second law of thermodynamics and entropy, real substances, steam power plants, refrigeration and heat pumps systems, heat transfer/heat	After completing the course the student will be able to: Analyze a particle dynamic system and/or a simple thermodynamic system and identify and select relevant theory so the student is able to perform serial mathematical calculations on variables and main	After completing the course the student can: Identify which parts of the acquired knowledge and skills that´s relevant to a given simple real-world particle dynamic or thermodynamic problem. Relate the acquired knowledge and skills to create simple mathematical	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

Code	Title	ECTS-points	Knowledge	Skills	Competences	Test
			exchangers. Kinematics of a particle and kinetics of a particle, steady flow of a fluid stream and work and energy.	capacities for the system. Solve simple technical problems on the basis of fundamental calculus and dynamic or thermodynamic laws. Follow simple procedures with different techniques of stating and solving dynamic or thermodynamic problems. 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.	models of real-world particle dynamic or thermodynamic problems. Use their acquired skills and knowledge to study more Dynamics and Thermodynamic courses on the Supply Engineering education. Use a commercial mathematical and other software to solve and perform serial technical calculations.	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. External assessment Allowed tools: None Re-exams: Equal to the ordinary exam.
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.	Requirements for attending examination Course assignments account for 40 % of final grade; it is divided into 20% for 2 assignments and 20% for 1 mini project. The final exam will count 60%. The final exam divided into: a. Oral evaluation on the mini project (30%) b. Additional question from draw on the spot (30%) Type of examination: Individual oral examination based upon a subject found by draw and mini project discussion. Censor: Internal Allowed tools: None Re-examination: Course assignments account for 40 % of final grade while the final re-exam count 60%. The students might asked to do new mini project if required, improve the already submitted one or keep it without improvement.