

Opasraportti

FTech - Civil Engineering (2018 - 2019)

Tutkintorakenteet

Master of Science (Tech), Civil Engineering

Tutkintorakenteen tila: archived

Lukuvuosi: 2018-19

Lukuvuoden alkamispäivämäärä: 01.08.2018

Bridge studies (enintään 60 op)

If you have bridge studies in your PSP, please fill them here.

Module of the Options (55 - 60 op)

Choose one of module of the option.

Water and Geo Engineering

A485221: Module of the Option / Geo Engineering, 60 op

Compulsory

- 488110S: Water and Wastewater Treatment, 5 op
- 488121S: Fundamentals of Civil Engineering, 5 op
- 488129S: Foundation Engineering, 5 op
- 488127S: Field measurements, site investigations and geotechnical tests, 5 op
- 488128S: Laboratory tests in water resources engineering, 5 op
- 488131S: Geoenvironmental Engineering, 5 op
- 488135S: Water distribution and sewage networks, 5 op
- 488134S: Hydrogeology and groundwater engineering, 5 op
- 488111S: Modelling in Geoenvironmental Engineering, 5 op
- 488151A: Basics of Traffic Engineering, 5 op
- 488141S: Urban hydrology, 5 op
- 488154S: Road Design and Construction, 5 op

Structural Engineering and Construction Technology

A485222: Module of the Option/Structural Engineering and Construction Technology, 60 op

Compulsory

- 466111S: Building physics, 5 op
- 466109S: Concrete technology, 5 op
- 466107S: Design of concrete structures, 6 op
- 466105S: Design of Steel Structures, 6 op
- 466117S: Structural renovation of buildings, 5 op

466114S: Building information modeling, 5 op

488129S: Foundation Engineering, 5 op

485021A: Construction Contracting, 5 op

Choose at least 25 ECTS

466110S: Advanced topics on concrete technology, 5 op

466108S: Advanced topics on design of concrete structures, 6 op

466106S: Advanced topics on design of steel structures, 6 op

466112S: Advanced topics on building physics, 5 op

466118S: Advanced topics on structural engineering and construction technology, 5 - 10 op

488121S: Fundamentals of Civil Engineering, 5 op

488111S: Modelling in Geoenvironmental Engineering, 5 op

488131S: Geoenvironmental Engineering, 5 op

488127S: Field measurements, site investigations and geotechnical tests, 5 op

488151A: Basics of Traffic Engineering, 5 op

488152S: Advanced Course in Traffic Engineering, 5 op

488153A: Basics of Road Engineering, 5 op

488154S: Road Design and Construction, 5 op

466116S: Information modelling and automation in building construction and maintenance, 2,5 - 5 op

466115S: Information modelling and automation in infrastructure construction and maintenance, 5 op

Supplementary Modules (25 - 45 op)

You can choose courses free in this MOdule or choose at least one of Supplementary Modules. Insert enough studies to Degree (90 ECTS+Master's Thesis).

Practical Training

477005S: Advanced Practical Training, 5 op

460004S: Practical Training II, 5 op

Water and Geo Engineering

A485246: Supplementary Module / Geo Engineering, 30 op

Free choice courses

461102A: Statics, 5 op

461103A: Strength of materials I, 5 op

466101A: Introduction to building construction, 5 op

466102A: Introduction to structural design, 3 - 5 op

488123S: River Engineering and Hydraulic Structures, 5 op

488139S: Surface water quality modelling, 5 op

492300A: Rock mechanics, 5 op

488153A: Basics of Road Engineering, 5 op

488152S: Advanced Course in Traffic Engineering, 5 op

Structural Engineering and Construction Technology

A460256: Supplementary Module/Structural Engineering and Construction Technology, 25 op

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466106S: Advanced topics on design of steel structures, 6 op

466108S: Advanced topics on design of concrete structures, 6 op

466110S: Advanced topics on concrete technology, 5 op

466112S: Advanced topics on building physics, 5 op

466115S: Information modelling and automation in infrastructure construction and maintenance, 5 op

466116S: Information modelling and automation in building construction and maintenance, 2,5 - 5 op

466118S: Advanced topics on structural engineering and construction technology, 5 - 10 op

488111S: Modelling in Geoenvironmental Engineering, 5 op

488121S: Fundamentals of Civil Engineering, 5 op

488127S: Field measurements, site investigations and geotechnical tests, 5 op

488131S: Geoenvironmental Engineering, 5 op

488151A: Basics of Traffic Engineering, 5 op

488152S: Advanced Course in Traffic Engineering, 5 op

488153A: Basics of Road Engineering, 5 op

488154S: Road Design and Construction, 5 op

Free choice courses

Master's Thesis (30 op)

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485991S: Master's Thesis Seminar, 0 op

485999S: Master's Thesis in Civil Engineering, 30 op

485990S: Maturity Test, Civil Engineering, 0 op

Tutkintorakenteisiin kuulumattomat opintokokonaisuudet ja -jaksot

485402S: Advanced Course in Traffic Engineering, 5 op

485403A: Basics of Road Engineering, 5 op

488132S: Cold Climate Engineering, 5 op

Opintojaksojen kuvaukset

Tutkintorakenteisiin kuuluvien opintokohteiden kuvaukset

A485221: Module of the Option / Geo Engineering, 60 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Module of the Option

Laji: Study module

Vastuuyksikkö: Civil Engineering field

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Compulsory

488110S: Water and Wastewater Treatment, 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Elisangela Heiderscheidt

Opintokohteen kielet: English

Leikkaavuudet:

480151S	Water and Wastewater Treatment	7.0 op
480208S	Industrial Water and Wastewater Treatment	3.5 op

ECTS Credits:

5 ECTS credits/133 hours of work

Language of instruction:

English

Timing:

The course unit is held in the autumn semester, during period 1

Learning outcomes:

Upon completion of the course, the student will be able to understand the theory and practicalities behind the most used purification processes in water and wastewater treatment. The student will also be capable of performing basic dimensioning calculations and therefore he/she will be able to dimension structures/units of water and wastewater treatment plants and to comprehend the basic requirements of different purification processes.

Contents:

Water quality characteristics of source water; basic principles of purification processes (coagulation/flocculation, sedimentation, biological treatment, filtration, disinfection, etc); process units in water and waste water treatment; selection of process units; dimensioning of treatment structures and unit processes.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures (30 h), field visits (5 h), exercises and other assignments (60) and self-study (38 h).

Target group:

Students in Master program of Environmental Engineering and in master program of civil engineering.

Prerequisites and co-requisites:

The required prerequisite is the completion of the following course or to have corresponding knowledge prior to enrolling for the course unit: Introduction to process and environmental engineering (477013P) or I (477011P) and II (488010P)

Recommended optional programme components:

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Recommended or required reading:

To be provided during the course.

Assessment methods and criteria:

The course can be completed in two different study modes: A) Active mode: midterm exam based on reading material + completion of 2 group exercises + final exam based on lectures and exercises; B) Passive mode (book exam): 100% self-study mode where the student is provided with 2-3 reference books and attends an exam based on the provided material. (Passive mode can be complete under special circumstances)

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Post-doctoral researcher Dr Elisangela Heiderscheidt

Working life cooperation:

Through visits to water and wastewater treatment plants, which include lectures provided by environmental engineers in charge and guided tours, the students familiarize with the main technological and process related principles of the field and have the chance to experience in first hand how to deal with some of the most common issues related to water and wastewater purification systems.

Other information:

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488121S: Fundamentals of Civil Engineering, 5 op**Voimassaolo:** 01.08.2011 -**Opiskelumuoto:** Advanced Studies**Laji:** Course**Vastuuyksikkö:** Field of Process and Environmental Engineering**Arvostelu:** 1 - 5, pass, fail**Opettajat:** Anssi Rauhala**Opintokohteen kielet:** Finnish**ECTS Credits:**

5 ECTS credits/133 hours of work

Language of instruction:

Finnish

Timing:

The course unit is held in the autumn semester, during period 1

Learning outcomes:

The student knows how to calculate stability and settlement of municipal earth structures, design the structures against frost depth and frost heave and evaluate the needs for soil improvement. The student knows risks of the excavations and slopes and can design those using mathematical theories.

Contents:

Norms and instructions, basis of geotechnical design, earth and road structures, properties of soil material and industrial by-products, soil improvement, excavations, Property and surface drainage, lowering of groundwater table. Pipeline Construction. Specialities of railway construction and vibration problems.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures (34 h) and design and calculation exercises (10 h) also self-study (91 h)

Target group:

Master students in the Water and Geo Engineering study option of the Environmental Engineering program

Prerequisites and co-requisites:

Prerequisites: 488115A Geomechanics, 477032A AutoCAD and Matlab in process and environmental engineering (or similar AutoCAD knowledge)

Recommended optional programme components:

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Recommended or required reading:

Handout and other materials delivered in lectures

Assessment methods and criteria:

Examination and homeworks

Read more about [assessment criteria](#) at the University of Oulu webpage.**Grading:**

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University teacher Anne Tuomela (substitute: researcher Anssi Rauhala)

Working life cooperation:

The course includes guest lectures from various sectors of civil engineering.

Other information:

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488129S: Foundation Engineering, 5 op**Voimassaolo:** 28.11.2016 -**Opiskelumuoto:** Advanced Studies**Laji:** Course**Vastuuyksikkö:** Field of Process and Environmental Engineering**Arvostelu:** 1 - 5, pass, fail**Opettajat:** Veikko Pekkala**Opintokohteen kielet:** Finnish**Leikkaavuudet:**

ay485302A Foundation Engineering (OPEN UNI) 5.0 op

ECTS Credits:

5 ECTS credits/133 hours of work

Language of instruction:

5 ECTS credits / 132 hours of work

Timing:

The course unit is held in the autumn semester during period 2

Learning outcomes:

After completing the course, students can choose the right foundation type and design shallow and deep foundations. After completing the course the student is also able to design earth retaining structures, drainage and frost protection.

Contents:

The following topics are covered during the course: The basis of geotechnical and structural design of foundations. Foundation types and foundation construction. Piles and piled foundations. Ground bearing slabs. Gravity and embedded walls. Ground improvement. Drainage. Frost protection.

Mode of delivery:

Lecture room teaching.

Learning activities and teaching methods:

Lectures and exercises

Target group:

Master's students of environmental and civil engineering

Prerequisites and co-requisites:

Recommend course 488115A Geomechanics

Recommended or required reading:

1. Lecture material.
2. RIL 254-2016, Paalutusohje
3. RIL 263-2014 Kaivanto-ohje
4. Decoding Eurocode 7 (2008), Bond, A. and Harris, A., Taylor & Francis, (Contents are informed during lectures).

Assessment methods and criteria:

Passed practical works and exam

Grading:

Rating scale 1-5

Person responsible:

Researcher Veikko Pekkala

488127S: Field measurements, site investigations and geotechnical tests, 5 op**Voimassaolo:** 01.08.2015 -**Opiskelumuoto:** Advanced Studies**Laji:** Course**Vastuuyksikkö:** Field of Process and Environmental Engineering**Arvostelu:** 1 - 5, pass, fail**Opettajat:** Ali Torabi Haghghi**Opintokohteen kielet:** English**Leikkaavuudet:**

488118S Laboratory Exercises and Field Measurements in Environmental Engineering 10.0 op

ECTS Credits:

5 ECTS /133 hours of work

Language of instruction:

English

Timing:

The course unit is given during periods 1 and 2

Learning outcomes:

Upon completion the student should be able to design field measurements and understand the quality of sampling and measurements in the field of environmental engineering. The student also improves skills of working in a team of fellow students to share expertise and execution responsibilities. The student understands the laboratory testing procedures and the associated parameters that help in estimating the soil mechanics and Geotechnical engineering and. The student knows how to use different methods for field measurement and sampling in water and geotechnical issues. The student can take considering the safety during the laboratory works and field measurements. After the course, the student can write detailed engineering reports.

Contents:

In the lectures: Units of measurements, error and mistake in laboratory works and field measurements, random and systematic error, precision and accuracy in laboratory work, planning field works, description of measuring site, securing results and material, sample preservation, subsoil exploration, direct & indirect methods of exploration, disturb and undisturbed samples, safety in field work, introduction on surveying, levelling, map and scale, different tests in soil mechanics laboratory.

Laboratory works in soil mechanics and geotechnical engineering: sieving test, hydrometer test, Atterberg limits test, proctor test, direct shear box test and oedometer test.

In the field: Working with GPS. Levelling and collecting data for preparing topography map. Soil sampling, surface water and groundwater sampling, Measuring velocity and discharge of river by using current meter and tracer.

Mode of delivery:

Face-to-face teaching, laboratory working

Learning activities and teaching methods:

Lectures (16 h), Fieldwork (20 h), Lab-work (9 h), Group work (88 h)

Target group:

Master students in the Water and Geo Engineering and Water and Environment study options

Prerequisites and co-requisites:

The required prerequisite is the completion of the following course prior to enrolling for the course unit:
488115A Geomechanics

Recommended optional programme components:

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Recommended or required reading:

Field measurements and Laboratory work instruction, lecture materials

Assessment methods and criteria:

Two exams (40%), Report (50%) and assignments (10%), passing the exam is requirement for passing the course

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University Teacher Ali Torabi Haghighi

Working life cooperation:

No

Other information:

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488128S: Laboratory tests in water resources engineering, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Ali Torabi Haghighi

Opintokohteen kielet: English

Leikkaavuudet:

488118S Laboratory Exercises and Field Measurements in Environmental Engineering 10.0 op

ECTS Credits:

5 ECTS /133 hours of work

Language of instruction:

English

Timing:

The course unit is given during the spring periods 3 and 4

Learning outcomes:

Upon completion this course, the student improves their skills of working in a team of fellow students to share expertise and execution responsibilities. The student understands the laboratory testing procedures and the associated parameters that help in estimating the water, and waste water properties. The laboratory work contains 3 main parts: fluid mechanics and open channel, water and waste water and ground water engineering.

Contents:

In the lectures: Units of measurements, error and mistake in laboratory works, how to write lab report, safety in laboratory, calibration, introduction to laboratory test in fluid mechanics and open channel hydraulics, introduction to laboratory tests in water and waste water engineering and introduction to groundwater engineering.

In laboratory: Laboratory works on Fluid mechanics and open channel hydraulics contain different method for discharge measurement, Bernoulli equation, Momentum equation, reservoir outflow, Pump and pumping, gates and wires, hydraulic jump and tracer test. Laboratory works on Ground water engineering contain hydraulic conductivity (K), specific yield (S), porosity (n) and PF curve test, Darcy law and groundwater flow, contaminant transport. Laboratory works on water and waste water engineering contain Jar test experiment, settling velocity, limestone (CaCO₃) filtration, aeration determination of Fe, Cl-, Mn.

Mode of delivery:

Face-to-face teaching, laboratory working

Learning activities and teaching methods:

Lectures (10 h), Lab-work (30 h), Group work (93 h)

Target group:

Master students in the Water and Geo Engineering and Water and Environment study options

Prerequisites and co-requisites:

The required prerequisite is the completion of the following courses prior to enrolling for the course unit: 488102 Hydrological Processes, 488108S Groundwater Engineering, 488110S Water and Wastewater Treatment, 488113S Introduction to Surface Water Quality Modelling

Recommended optional programme components:

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Recommended or required reading:

Field measurements and Laboratory work instruction, lecture materials

Assessment methods and criteria:

Each exercise is evaluated graded on the scale 1-5. The final grade of the course is weighted average of following parts participate in the lectures (5%), participate in the laboratory (20% if the respective report will be presented), assignments (10%), and reports (50%), Exam (15%).

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University Teacher Ali Torabi Haghighi

Other information:

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488131S: Geoenvironmental Engineering, 5 op

Voimassaolo: 01.08.2013 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Anssi Rauhala

Opintokohteen kielet: Finnish

Leikkaavuudet:

485306S Geoenvironmental Engineering 5.0 op

ECTS Credits:

5 ECTS credits/133 hours of work

Language of instruction:

Finnish and option complete in English

Timing:

The course unit is held in the autumn semester during period 1

Learning outcomes:

The student knows norms and instruction which are related to contaminated sites. The students can choose the suitable remediation technique for contaminated soil. The student can calculate contaminant transport in soils. The student can also design geotechnical structures of industrial and domestic landfills and evaluate the needs for remediation of contaminated soils. Student know how to used by-products from industry in different applications.

Contents:

Norms and instructions, there will be a project work where student will be discover a contaminated soil and a proposal remediation technique, Properties of soil material and industrial by-products, basis of geotechnical design to landfill environment, Structures of dams and inpondments, Challenges of mining, Remote sensing as a part of geotechnical applications.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures (44 h), group work (60 h) and independent work (31 h)

Target group:

Master students in the study option of Water and Geo Engineering

Prerequisites and co-requisites:

488115A Geomechanics

Recommended optional programme components:

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Recommended or required reading:

Handout and other materials delivered in lectures

Assessment methods and criteria:

Written exam and exercises

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University teacher Anne Tuomela (substitute: researcher Anssi Rauhala)

Working life cooperation:

The course includes a visit to the Rusko waste center and also guest lectures from professionals in industry and administration.

Other information:

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488135S: Water distribution and sewage networks, 5 op

Voimassaolo: 28.11.2016 - 31.07.2019

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Pekka Rossi

Opintokohteen kielet: English

Leikkaavuudet:

488144A Water distribution and sewage networks 5.0 op

ECTS Credits:

5 ECTS credits/133 hours of work

Language of instruction:

English

Timing:

The course unit is held in the autumn semester, in period 2

Learning outcomes:

Student knows and understands the systems and dynamics needed for water distribution and waste water networks. Student is able to do basic dimensioning for water distribution network and sewer system of an urban area.

Contents:

Water distribution and waste water network design and dimensioning, Pumping and storage tanks needed in distribution of water and collection of sewage waters, renovation of pipelines, special circumstances in water distribution, effects of cold climate and harmful hydraulic conditions.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures (30 h), homework (45 h) and a design exercise (58 h).

Target group:

Students in master program of environmental engineering and in master program of civil engineering

Prerequisites and co-requisites:

Use of AutoCAD-program

Recommended optional programme components:

The recommended prerequisite is the completion of the following course prior to enrolling for the course unit: 477052A Virtaustekniikka, 477312A Lämmön- ja aineensiirto 488102A Hydrological Processes and 488051A AutoCAD ja Matlab prosessi- ja ympäristötekniikan työkaluna or at least equivalent information about water management.

Recommended or required reading:

Lecture handout and other materials delivered in lectures. To the appropriate extent: RIL 237-1-2010 Vesihuoltoverkkojen suunnittelu, RIL 237-2-2010 Vesihuoltoverkkojen suunnittelu, RIL 124-2 Vesihuolto II, Mays Water distribution systems handbook

Assessment methods and criteria:

Exam and a design exercise.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Postdoctoral Researcher Pekka Rossi

Working life cooperation:

Visit to a site of water distribution network building site, pumping station or water supply/sewerage company.

488134S: Hydrogeology and groundwater engineering, 5 op

Voimassaolo: 28.11.2016 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Pekka Rossi

Opintokohteen kielet: English

ECTS Credits:

5 ECTS credits/133 hours of work

Language of instruction:

English

Timing:

The course unit is held in the spring semester, during period 3

Learning outcomes:

Upon completion of the course, the student will have knowledge on groundwater systems and the basic hydrogeological and engineering concepts involved. This includes analysis of flow in porous media, hydraulics of groundwater systems, groundwater quality and groundwater use. After the course students are able to estimate key factors influencing on groundwater recharge, flow and discharge and to use general methods to calculate groundwater flow.

Contents:

2D and 3D groundwater flow, conceptual models, unsaturated layer flow, water storage and retention, heterogeneity and isotropy, aquifer types, pumping tests, geophysical methods, groundwater quality and resources in Finland

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

lectures (18 h), calculus lectures (12 h), homework, exercises and self-study (103 h).

Target group:

Master students in the water engineering orientation of the Environmental Engineering program and in master program of civil engineering

Prerequisites and co-requisites:

The required prerequisite is the completion of the following course prior to enrolling for the course unit: 488102A Hydrological Processes

Recommended or required reading:

Lecture handouts, Physical and Chemical Hydrogeology (Domenico PA, Schwartz FW, 2nd edition, 1998, ISBN 0-471- 59762-7). Maanalaiset vedet - pohjavesigeologi-an perusteet (Korkka-Niemi K, Salonen V-P, 1996, ISBN 951-29-0825-5). Pohjavesi ja pohjaveden ympäristö (Mälkki E, 1999, ISBN 951-26-4515-7).

Assessment methods and criteria:

exam and/or lecture exams.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Postdoctoral Researcher Pekka Rossi

Working life cooperation:

Students familiarize themselves to a real groundwater aquifer cases discussed in lectures and in the course exercise.

488111S: Modelling in Geoenvironmental Engineering, 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Anssi Rauhala

Opintokohteen kielet: Finnish

Leikkaavuudet:

485305S Modelling in Geoenvironmental Engineering 5.0 op

ECTS Credits:

5 ECTS credits/133 hours of work

Language of instruction:

Finnish

Timing:

The course unit is given in the spring semester, during period 4

Learning outcomes:

After the course the student can apply the numerical calculation methods in design and dimensioning of earth and geoenvironmental structures. The student can evaluate the influence of boundary conditions and material parameters in calculation results.

Contents:

Contaminant transport. Design and dimensioning of piles, tailings and dams structures. Settlement calculation due to different load types. Calculating the earth pressure of retaining walls. Freezing and thawing of earth structures. Geotechnical design of pile foundation.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures (10 h), design (58 h) and modelling assignments (65 h).

Target group:

Master's students in the study option of Water and Geoenvironmental Engineering

Prerequisites and co-requisites:

The required prerequisite: 488115A Geomechanics. Also recommended: 488051A AutoCAD and Matlab in Process and Environmental Engineering, 488121S Fundamentals of Civil Engineering, 488129S Foundation Engineering, 488131S Geoenvironmental Engineering.

Recommended optional programme components:

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Recommended or required reading:

Lecture handout and other materials delivered in lectures

Assessment methods and criteria:

Passing the course requires solving the given assignments and writing reports about them. The assignments are solved with computer modelling, which requires constant participation to the lectures.

Grading:

The course utilizes verbal grading scale pass/fail.

Person responsible:

University teacher Anne Tuomela (substitute: researcher Anssi Rauhala)

Working life cooperation:

The course includes guest lectures from an international consulting and engineering company.

Other information:

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488151A: Basics of Traffic Engineering, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Virve Merisalo

Opintokohteen kielet: Finnish

Leikkaavuudet:

485401A Basics of Traffic Engineering 5.0 op

ECTS Credits:

5 ECTS / 133 h of work

Language of instruction:

Finnish

Timing:

The course unit is given in the autumn semester, during period 1

Learning outcomes:

By completing the course the student knows the basics of modes of transport, the significance of traffic and transportation to society, traffic planning and research methods, transport economics and the external effects of transport.

Contents:

Modes of transport, Need for traffic and transportation, Transport planning and research, Economical and environmental impacts of traffic, Traffic safety.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h, exercises 22 h, self-study 85 h

Target group:

Students in the Master's Programmes of environmental engineering and mechanical engineering

Prerequisites and co-requisites:

No

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time

Recommended or required reading:

Materials delivered during the lectures

Assessment methods and criteria:

Examination and exercises

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University teacher Virve Merisalo

Working life cooperation:

No

Other information:

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488141S: Urban hydrology, 5 op

Voimassaolo: 28.11.2016 - 31.07.2020

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Pekka Rossi

Opintokohteen kielet: English

Leikkaavuudet:

488146S Urban water management 5.0 op

ECTS Credits:

5 ECTS credits/133 hours of work

Language of instruction:

English

Timing:

The course unit is held in the spring semester, in period 3

Learning outcomes:

Student has a knowledge on the different aspects of urban hydrology to manage waters in a built environment. Student understands the challenges concerning quantity and quality questions of urban waters and can take them into account in designing.

Contents:

Storm water system design, green infrastructure, urban erosion, drainage, flood control and climate change in urban hydrology, urban water quality and constructed wetlands.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures (30 h), homeworks (45 h) and a design exercise (58 h).

Target group:

Students in master program of environmental engineering and in master program of civil engineering

Prerequisites and co-requisites:

Use of AutoCAD-programs. This course is a straight continuation of course 488135A Water distribution and sewage networks (recommended but not prerequisite prior to this course).

Recommended optional programme components:

The recommended prerequisite is the completion of the following course prior to enrolling for the course unit: 477052A Fluid mechanics, 477312A Lämmön- ja aineensiirto 488102A Hydrological Processes and 488051A AutoCAD ja Matlab prosessi- ja ympäristötekniikan työkaluna or at least equivalent information about water management.

Recommended or required reading:

Lecture handouts, Hulevesiopas (2012, in Finnish)

Assessment methods and criteria:

Examination, seminar and a design exercise.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Postdoctoral Researcher Pekka Rossi

Working life cooperation:

Course includes guest lectures of storm water designers/consultants and/or municipalities/cities responsible for the storm water management.

488154S: Road Design and Construction, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Virve Merisalo

Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS / 133 h of work

Language of instruction:

Finnish

Timing:

The course unit is held in the spring semester, during period 4

Learning outcomes:

By completing the course the student is familiar with road structure and function, structural modernisation, pavements and the basics of earthworks. He/she is also able to design road computer aided.

Contents:

Function of road structure, road damaging, structural modernisation, pavements, Road design and construction

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h, exercises 32 h, self-study 75 h

Target group:

Students in the master's programmes of environmental engineering and mechanical engineering

Prerequisites and co-requisites:

488153A Road Design and Construction, and 488051A AutoCAD and Matlab in process and environmental engineering

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time

Recommended or required reading:

Materials delivered during the lectures

Assessment methods and criteria:

Examination and exercises

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Yliopisto-opettaja Virve Merisalo

Other information:

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A485222: Module of the Option/Structural Engineering and Construction Technology, 60 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Module of the Option

Laji: Study module

Vastuuyksikkö: Civil Engineering field

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Compulsory

466111S: Building physics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Filip Fedorik

Opintokohteen kielet: English

Leikkaavuudet:

485103A	Building physics	5.0 op
460160S-01	Building Physics, examination	0.0 op
460160S-02	Building Physics, exercises	0.0 op
460160S	Building Physics	3.5 op

ECTS Credits:

5 ECTS credits / 132 hours of work

Language of instruction:

Finnish

Timing:

Autumn, Periods 1-2

Learning outcomes:

After completing the course the student can explain basic phenomenon of building physics. The student can analyse and describe heat, air and moisture transfer in buildings and also explain main causes of typical moisture damages. The student can explain factors affecting energy efficiency and can calculate the energy efficiency number. The student knows the calculation methods in acoustics.

Contents:

Thermal isolation design. Determination of structure temperature. Moisture transfer and moisture exiting. Airflows in structures. Energy efficiency in buildings. Acoustic design.

Mode of delivery:

Face-to-face and distance learning

Learning activities and teaching methods:

Lectures, excercises, case studies, and self directed learning

Target group:

Students studying structural engineering

Prerequisites and co-requisites:

466101A Introduction to building construction

Recommended or required reading:

The material that is in English will be distributed at the lectures 1) Lecture notes (mainly in Finnish) 2) Suomen rakentamismääräyskokoelman osat C1, C2, C3, C4 ja D3. 3) Introduction to Building Physics, Hagentoft, C.-E. (2001), ISBN 91-44-01896-7, (As specified in lectures).

Assessment methods and criteria:

Excercises and exam

Grading:

Numerical grading scale 1-5. Grade 0 stands for a fail.

Person responsible:

Raimo Hannila

466109S: Concrete technology, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jorma Hopia

Opintokohteen kielet: Finnish

Leikkaavuudet:

485105A	Concrete technology	5.0 op
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460155S-01	Concrete Technology, examination	0.0 op
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460155S-02 Concrete Technology, laboratory exercise 0.0 op
 460155S Concrete Technology 4.5 op

ECTS Credits:

5 ECTS credits / 132 hours of work

Language of instruction:

Finnish

Timing:

Spring semester, periods 3-4

Learning outcomes:

After completing the course the student is able to specify concrete and the materials from which it is made. They can design normal concrete mixes and identify, describe and carry out the main laboratory tests relevant to the use of concrete on site.

Contents:

Cements and cementitious materials, aggregates for concrete, concrete mix design, properties of fresh and hardened concrete, laboratory tests, specification testing and compliance, environmental exposure classes.

Mode of delivery:

Face-to-face and distance learning

Learning activities and teaching methods:

Lectures, exercises, case studies, laboratory sessions and self directed learning

Target group:

Students studying structural engineering

Prerequisites and co-requisites:

466101A Introduction to building construction

Recommended optional programme components:

466101A Introduction to building construction

Recommended or required reading:

The material that is in English will be distributed at the lectures. Lecture notes (mainly in Finnish), 1) Luennoilla jaettu materiaali 2) Järvinen, Maarit. 2004. Betonitekniikan oppikirja : BY 201. Helsinki : Suomen Betonitieto.; 3) Suomen betoniyhdistys. Betoninormit 2004: BY 50. Helsinki : Suomen betonitieto; 4) Suomen Standardisoimisliitto ry. SFS-Standardisointi: 5) SFS-EN Standards

Assessment methods and criteria:

Passed laboratory exercises and exam

Grading:

Numerical grading scale 1-5. Grade 0 stands for a fail.

Person responsible:

Raimo Hannila

466107S: Design of concrete structures, 6 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Antti Niemi

Opintokohteen kielet: Finnish

Leikkaavuudet:

485106A Design of concrete structures 5.0 op

460147A Introduction to Design of Concrete Technology 4.0 op

460147A-01 Introduction to Design of Concrete Technology, examination 0.0 op

460147A-02	Introduction to Design of Concrete Technology, exercise work	0.0 op
460148S	Design of Concrete Structures	4.0 op
460148S-01	Design of Concrete Structures I, examination	0.0 op
460148S-02	Design of Concrete Structures I, exercises	0.0 op

ECTS Credits:

6 ECTS /162 hours

Language of instruction:

Finnish

Timing:

Lectures and exercising on periods 3 and 4.

Learning outcomes:

Upon completion of the course, the student will be able to design typical reinforced concrete structures to EN-standards.

Contents:

Strength and strain properties of concrete and reinforcing bars, time dependent properties. Limit state design of concrete beams and columns to EN standards. Service life design. Fire design. Anchoring and joints of reinforcing bars. Design of flanged cross sections, walls and wall like beams, and foundations carrying walls and columns.

Mode of delivery:

face-to-face teaching.

Learning activities and teaching methods:

Lectures and exercising 54 hours including personal and team work. Self-reliant studying and homework 108 hours.

Target group:

Master level students focusing on structural engineering and design.

Prerequisites and co-requisites:

Recommended good skills in: Statics, strength of materials, structural mechanics of beam and plated structures. Basics in concrete technology and structural design.

Recommended or required reading:

Nykyri: BY211 Betonirakenteiden suunnittelun oppikirja, osa 1, 2013 ja osa 2, 2015; Leskelä: By210 Betonirakenteiden suunnittelu ja mitoitus 2008; By60 Suunnitteluohje EC2 osat 1-1 ja 1-2, 2008; EN 1992-1-1, EN 1992-1-2 (ja muut EN-standardit tarvittavilta osin); BY51 Betonirakenteiden käyttöikäsuunnittelu 2007; BY47 Betonirakentamisen laatuohjeet 2007; RIL 229-2-2006 Rakennesuunnittelun asiakirjaohje, Mallipiirustukset ja -laskelmat; By47 Betonirakentamisen laatuohjeet 2007; RIL202-2012 Betonirakenteiden suunnitteluohje. Martin, Purkiss: Concrete design to EN 1992, Elsevier, 2nd ed. 2006. Lecture and exercise materials.

Assessment methods and criteria:

Continuous assessment. The course can be completed by participating in intermediate exams during the course, or in final exam. Assessment criteria are based on the learning outcomes of the course.

Grading:

The course utilises a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

university teacher Raimo Hannila, LSc (tech.)

466105S: Design of Steel Structures, 6 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Kangaspuoskari, Matti Johannes

Opintokohteen kielet: Finnish

Leikkaavuudet:

485118S	Design of Steel Structures	5.0 op
ay466105S	Design of Steel Structures (OPEN UNI)	6.0 op
460127S-01	Design of Steel Structures, examination	0.0 op
460127S-02	Design of Steel Structures, exercise work	0.0 op
460125A	Introduction to Design of Steel Structures	4.0 op
460125A-01	Introduction to Design of Steel Structures, examination	0.0 op
460125A-02	Introduction to Design of Steel Structures, exercise work	0.0 op
460127S	Design of Steel Structures	4.0 op

ECTS Credits:

6 ECTS

Language of instruction:

Finnish

Timing:

Periods 1 and 2

Learning outcomes:

After completing the course the student is capable of explaining the crystalline structure of steel material and he understands elasto-plastic material model. He is able to explain the effect of inclusions, heat treatment and welding process to the mechanical properties of a steel material. The student is familiar with fire design of steel structures. He is able to explain common types of corrosion. The student is able to design the most typical joints in a steel frame and he can analyze simple steel structures. He is also able to analyze stability problems and explain the effects of imperfections and second order effects on frame behavior and member forces.

Contents:

The following topics are covered during the course: Ferrous metals and their properties. Principles of Eurocodes. Design of simple steel structure under base loading cases and loading combinations. Corrosion. Design of joints in steel structures. Composite structures with steel member. Section classification. Effective cross-section. Cross-sections with stiffeners. Steel members in bending and axial compression. Buckling, lateral torsional buckling, and torsion.

Mode of delivery:

Face-to-face.

Learning activities and teaching methods:

Lectures and exercises 52 h. Self-study 110 h. Total 162 h = 6 ECTS Credits.

Target group:

Major students in Structural Engineering and Construction Technology, Mashine design, and Engineering Mechancs.

Prerequisites and co-requisites:

466102A Introduction to Structural Design. Key notes in courses Statics, Strength of Materials I, Strength of Materials II, Energy principles and Their Use in Beam Structures, and Plates and Shells and Mechanics of materials

Recommended or required reading:

Lecture notes (in Finnish). Eurocodes 1990-1999.

Assessment methods and criteria:

Three midterm exams or one final exam is required. One design exercise is required.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Matti Kangaspuoskari

466117S: Structural renovation of buildings, 5 op**Voimassaolo:** 01.08.2015 -**Opiskelumuoto:** Advanced Studies**Laji:** Course**Vastuuyksikkö:** Field of Mechanical Engineering**Arvostelu:** 1 - 5, pass, fail**Opintokohteen kielet:** Finnish**Leikkaavuudet:**

485104A Structural renovation of buildings 5.0 op

ECTS Credits:

5 ECTS credits / 132 hours of work

Language of instruction:

Finnish

Timing:

Autumn, Periods 1 and 2

Learning outcomes:

After completing the course students can describe different structural materials and structural systems used in residential buildings in 1900-2000. They are able to identify and explain the typical risk structures and defects in those buildings. They can also explain the old design codes and recommendation used in Finland.

Contents:

Finnish house construction and typical details during 1900-2000. Standards, design recommendations and design methods used in Finland.

Mode of delivery:

Lecture room teaching

Learning activities and teaching methods:

Lectures and exercises

Target group:

Students studying structural engineering

Prerequisites and co-requisites:

466101A Introduction to building construction, 466111S Building physics

Recommended or required reading:

Lecture material.

Assessment methods and criteria:

Passed practical works and exam

Grading:

The course utilizes a numerical grading scale 1-5. Numerical scale zero stands for a fail

Person responsible:

professor Rauno Heikkilä

466114S: Building information modeling, 5 op**Voimassaolo:** 01.08.2015 -**Opiskelumuoto:** Advanced Studies**Laji:** Course**Vastuuyksikkö:** Field of Mechanical Engineering**Arvostelu:** 1 - 5, pass, fail**Opettajat:** Jorma Hopia

Opintokohteen kielet: Finnish

Leikkaavuudet:

485202S	Building information modeling	5.0 op
460121S	Building information modelling	3.0 op

ECTS Credits:

5 ECTS credits / 132 hours of work

Language of instruction:

Finnish

Timing:

Autumn semester, periods 1-2

Learning outcomes:

After completing the course the student is able to make 3D models of buildings and detail the connections between building elements and components. He can model different building materials and is familiar with one commercial software.

Contents:

Modeling concrete and steel structures. Connections. Macros, Drawings.

Mode of delivery:

Face-to-face

Learning activities and teaching methods:

Lectures, exercises and self directed learning

Target group:

Students studying structural engineering

Recommended or required reading:

The material that is in English will be distributed at the lectures

Assessment methods and criteria:

Participation to lectures and exercises

Grading:

Pass or fail.

Person responsible:

Rauno Heikkilä

488129S: Foundation Engineering, 5 op

Voimassaolo: 28.11.2016 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Veikko Pekkala

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay485302A	Foundation Engineering (OPEN UNI)	5.0 op
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ECTS Credits:

5 ECTS credits/133 hours of work

Language of instruction:

5 ECTS credits / 132 hours of work

Timing:

The course unit is held in the autumn semester during period 2

Learning outcomes:

After completing the course, students can choose the right foundation type and design shallow and deep foundations. After completing the course the student is also able to design earth retaining structures, drainage and frost protection.

Contents:

The following topics are covered during the course: The basis of geotechnical and structural design of foundations. Foundation types and foundation construction. Piles and piled foundations. Ground bearing slabs. Gravity and embedded walls. Ground improvement. Drainage. Frost protection.

Mode of delivery:

Lecture room teaching.

Learning activities and teaching methods:

Lectures and exercises

Target group:

Master's students of environmental and civil engineering

Prerequisites and co-requisites:

Recommend course 488115A Geomechanics

Recommended or required reading:

1. Lecture material.
2. RIL 254-2016, Paalutusohje
3. RIL 263-2014 Kaivanto-ohje
4. Decoding Eurocode 7 (2008), Bond, A. and Harris, A., Taylor & Francis, (Contents are informed during lectures).

Assessment methods and criteria:

Passed practical works and exam

Grading:

Rating scale 1-5

Person responsible:

Researcher Veikko Pekkala

485021A: Construction Contracting, 5 op

Voimassaolo: 01.08.2018 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Civil Engineering field

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

488119A	Basics of infrastructure planning and development	5.0 op
466113S	Construction economics	5.0 op
460165A-02	Introduction to Construction Economics I, practical work	0.0 op
460165A-01	Introduction to Construction Economics I, examination	0.0 op

Other information:

This Course replaces courses 466113S and 488119A.

Choose at least 25 ECTS

466110S: Advanced topics on concrete technology, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jorma Hopia

Opintokohteen kielet: Finnish

Leikkaavuudet:

485115S	Advanced topics on concrete technology	5.0 op
485115S	Advanced topics on concrete technology	5.0 op
460156S-01	Advanced Course in Concrete Technology I, examination	0.0 op
460156S-02	Advanced Course in Concrete Technology I, laboratory exercises	0.0 op
460156S	Advanced Topics Concrete Technology I	4.0 op

ECTS Credits:

5 ECTS credits / 132 hours of work

Language of instruction:

Finnish

Timing:

Autumn semester, periods 1-2

Learning outcomes:

After completing the course the student is able to manage the goal of the subject by broadening the knowledge to new concrete types and their design methods, testing and application conditions and also on concrete with special properties such as e.g. high-quality, high strength and self-compressing. He can also explain how to assess the structural condition of concrete.

Contents:

Durability and defects of concrete structures, high-strength concrete, self-compacting concrete. Processing of secondary raw materials for the preparation of special concrete, utilization of fly ash, slag and dust.

Mode of delivery:

Face-to-face and distance learning

Learning activities and teaching methods:

Lectures, exercises, case studies, laboratory sessions and self directed learning

Target group:

Students studying structural engineering

Prerequisites and co-requisites:

466109S Concrete technology

Recommended or required reading:

The material that is in English will be distributed at the lectures 1) Lecture notes (mainly in Finnish) 2) BY 42, betonijulkisivun kuntotutkimus 2002, Suomen Betoniyhdistys. 3) BY 41, betonirakenteiden korjausohjeet, 2007, Suomen Betoniyhdistys. 4) IVO-B-13/91. 1991. Korkealujuusbetoni, uusi materiaali voimalaitosrakentamiseen, A. Ipatti. Imataran Voima Oy. 5) Itsetiivistyvä betoni, 2004, Suomen Betonitieto Oy. 6) Suomen betoniyhdistys. Betoninormit 2004 : BY 50. Helsinki : Suomen betonitieto. 7) BY 51, betonirakenteiden käyttökäsuunnittelu 2007. Suomen Betoniyhdistys

Assessment methods and criteria:

Passed laboratory exercises and exam

Grading:

Numerical grading scale 1-5. Grade 0 stands for a fail.

Person responsible:

Raimo Hannila

466108S: Advanced topics on design of concrete structures, 6 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Antti Niemi

Opintokohteen kielet: Finnish

Leikkaavuudet:

485116S	Advanced topics on design of concrete structures	5.0 op
460149S	Advanced Topics on Design of Concrete Structures I	4.0 op
460149S-01	Advanced Course in Design of Concrete Structures I, examination	0.0 op
460149S-02	Advanced Course in Design of Concrete Structures I, exercises	0.0 op

ECTS Credits:

6 ECTS / 162 hours

Language of instruction:

Finnish

Timing:

Lectures and exercising on periods 1 and 2.

Learning outcomes:

Upon completion of the course, the student will be able to design reinforced concrete slabs and pre-stressed concrete beam structures to EN standards.

Contents:

Limit state design of concrete slabs and flat slabs. Limit state design of pre-stressed concrete beam structures. Fire design. Design of concrete elements. Stability and stiffening of the concrete frame in the building.

Mode of delivery:

face-to-face teaching.

Learning activities and teaching methods:

Lectures and exercising 54 hours including personal and team work. Self-reliant studying and homework 108 hours.

Target group:

Master level students focusing on structural engineering and design.

Prerequisites and co-requisites:

Recommended good skills in: 466107S Design of concrete structures. Statics, strength of materials, structural mechanics of beam, plate and shell structures. Basics in concrete technology and structural design.

Recommended or required reading:

Nykyri: BY211 Betonirakenteiden suunnittelun oppikirja, osa 1, 2013 ja osa 2, 2015; Leskelä: By210 Betonirakenteiden suunnittelu ja mitoitus 2008; By60 Suunnitteluohje EC2 osat 1-1 ja 1-2, 2008; EN 1992-1-1, EN 1992-1-2 (ja muut EN-standardit tarvittavilta osin); BY51 Betonirakenteiden käyttöikäsuunnittelu 2007; BY47 Betonirakentamisen laatuohjeet 2007; RIL 229-2-2006 Rakennesuunnittelun asiakirjaohje, Mallipiirustukset ja -laskelmat; By47 Betonirakentamisen laatuohjeet 2007; RIL202-2012 Betonirakenteiden suunnitteluohje. Martin, Purkiss: Concrete design to EN 1992, Elsevier, 2nd ed. 2006. Lecture and exercise materials.

Assessment methods and criteria:

Continuous assessment. The course can be completed by participating in intermediate exams during the course, or in final exam. Assessment criteria are based on the learning outcomes of the course.

Grading:

The course utilises a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

university teacher Raimo Hannila, LSc (tech.)

Other information:

The real-time qualifications for A and AA level structural designers in Finland should be checked out at: Rakennus-, LVI- ja kiinteistöalan henkilöpatentydet FISE Oy, <http://www.fise.fi/>.

466106S: Advanced topics on design of steel structures, 6 op

Voimassaolo: 01.08.2015 -

Opiskelumoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Kangaspuoskari, Matti Johannes

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay466106S	Advanced topics on design of steel structures (OPEN UNI)	6.0 op
460128S-01	Advanced Course in Design of Steel Structures I, examination	0.0 op
460128S-02	Advanced Course in Design of Steel Structures I, exercise work	0.0 op
460128S	Advanced Topics on Design of Steel Structures I	4.0 op

ECTS Credits:

6 ECTS

Language of instruction:

Finnish

Timing:

Periods 3 and 4

Learning outcomes:

After completing the course the student is capable of explain the performance and design principles of welded steel structures exposed to fatigue loading. He is able to design the plated structural elements and cold-formed members. He is able to analyze and design a steel frame. He is able to analyze dynamically loaded structures and can explain the effect of vibration on steel structures strength and reliability.

Contents:

The following topics are covered during the course: Steel structure under fatigue load. Fracture toughness. Stability and bracing of a steel frame building. Fire design. Plated structural elements with stiffeners. Elements resistance to transverse forces. Cold-formed members. Mechanical vibrations. Seismic design. Chimneys. Crane supporting structures. Accidental design situations and progressive collapse.

Mode of delivery:

Face-to-face.

Learning activities and teaching methods:

Lectures and exercises 52 h. Self-study 110 h. Total 162 h = 6 ECTS Credits.

Target group:

Major students in Structural Engineering, Mashine design, and Engineering Mechancs. 466102A

Prerequisites and co-requisites:

460117A Introduction to Structural Design and 466105S Design of Steel Structures. Key notes in courses Statics, Strength of Materials I, Strength of Materials II, Mechanics of materials and Mechanical Vibrations.

Recommended or required reading:

Lecture notes (in Finnish). Eurocodes 1990-1999.

Assessment methods and criteria:

Three midterm exams or one final exam is required. One design exercise is required.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Matti Kangaspuoskari

466112S: Advanced topics on building physics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Filip Fedorik

Opintokohteen kielet: English

Leikkaavuudet:

485113S Advanced topics on building physics 5.0 op

ECTS Credits:

5 ECTS credits / 132 hours of work

Language of instruction:

English

Timing:

Autumn, periods 1-2

Learning outcomes:

After completing the course the student can explain the different physical phenomena that affect the temperature and moisture behaviour of different structures. He can also study numerically the building-physical behaviour of structures and structural systems. He can use different software to simulate the behaviour and solve problems. He can assess the potential mould risk of structure based on temperature and relative humidity values measured on site.

Contents:

Computational modelling and analysis methods of building-physical behavior of structures. Site measurements. Mould index.

Mode of delivery:

Face-to-face and distance learning

Learning activities and teaching methods:

Lectures, excercises, case studies and self directed learning

Target group:

Students studying structural engineering

Prerequisites and co-requisites:

466101A Introduction to building construction, 466111S Building physics

Recommended or required reading:

The material that is in English will be distributed at the lectures

Assessment methods and criteria:

Excercises and homework

Grading:

Numerical grading scale 1-5. Grade 0 stands for a fail.

Person responsible:

Filip Fedorik

466118S: Advanced topics on structural engineering and construction technology, 5 - 10 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

488121S: Fundamentals of Civil Engineering, 5 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Anssi Rauhala

Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS credits/133 hours of work

Language of instruction:

Finnish

Timing:

The course unit is held in the autumn semester, during period 1

Learning outcomes:

The student knows how to calculate stability and settlement of municipal earth structures, design the structures against frost depth and frost heave and evaluate the needs for soil improvement. The student knows risks of the excavations and slopes and can design those using mathematical theories.

Contents:

Norms and instructions, basis of geotechnical design, earth and road structures, properties of soil material and industrial by-products, soil improvement, excavations, Property and surface drainage, lowering of groundwater table. Pipeline Construction. Specialities of railway construction and vibration problems.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures (34 h) and design and calculation exercises (10 h) also self-study (91 h)

Target group:

Master students in the Water and Geo Engineering study option of the Environmental Engineering program

Prerequisites and co-requisites:

Prerequisites: 488115A Geomechanics, 477032A AutoCAD and Matlab in process and environmental engineering (or similar AutoCAD knowledge)

Recommended optional programme components:

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Recommended or required reading:

Handout and other materials delivered in lectures

Assessment methods and criteria:

Examination and homeworks

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University teacher Anne Tuomela (substitute: researcher Anssi Rauhala)

Working life cooperation:

The course includes guest lectures from various sectors of civil engineering.

Other information:

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488111S: Modelling in Geoenvironmental Engineering, 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Anssi Rauhala

Opintokohteen kielet: Finnish

Leikkaavuudet:

485305S Modelling in Geoenvironmental Engineering 5.0 op

ECTS Credits:

5 ECTS credits/133 hours of work

Language of instruction:

Finnish

Timing:

The course unit is given in the spring semester, during period 4

Learning outcomes:

After the course the student can apply the numerical calculation methods in design and dimensioning of earth and geoenvironmental structures. The student can evaluate the influence of boundary conditions and material parameters in calculation results.

Contents:

Contaminant transport. Design and dimensioning of piles, tailings and dams structures. Settlement calculation due to different load types. Calculating the earth pressure of retaining walls. Freezing and thawing of earth structures. Geotechnical design of pile foundation.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures (10 h), design (58 h) and modelling assignments (65 h).

Target group:

Master's students in the study option of Water and Geoenvironmental Engineering

Prerequisites and co-requisites:

The required prerequisite: 488115A Geomechanics. Also recommended: 488051A AutoCAD and Matlab in Process and Environmental Engineering, 488121S Fundamentals of Civil Engineering, 488129S Foundation Engineering, 488131S Geoenvironmental Engineering.

Recommended optional programme components:

-

Recommended or required reading:

Lecture handout and other materials delivered in lectures

Assessment methods and criteria:

Passing the course requires solving the given assignments and writing reports about them. The assignments are solved with computer modelling, which requires constant participation to the lectures.

Grading:

The course utilizes verbal grading scale pass/fail.

Person responsible:

University teacher Anne Tuomela (substitute: researcher Anssi Rauhala)

Working life cooperation:

The course includes guest lectures from an international consulting and engineering company.

Other information:

-

488131S: Geoenvironmental Engineering, 5 op

Voimassaolo: 01.08.2013 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Anssi Rauhala

Opintokohteen kielet: Finnish

Leikkaavuudet:

485306S Geoenvironmental Engineering 5.0 op

ECTS Credits:

5 ECTS credits/133 hours of work

Language of instruction:

Finnish and option complete in English

Timing:

The course unit is held in the autumn semester during period 1

Learning outcomes:

The student knows norms and instruction which are related to contaminated sites. The students can choose the suitable remediation technique for contaminated soil. The student can calculate contaminant transport in soils. The student can also design geotechnical structures of industrial and domestic landfills and evaluate the needs for remediation of contaminated soils. Student know how to used by-products from industry in different applications.

Contents:

Norms and instructions, there will be a project work where student will be discover a contaminated soil and a proposal remediation technique, Properties of soil material and industrial by-products, basis of geotechnical design to landfill environment, Structures of dams and inpoundments, Challenges of mining, Remote sensing as a part of geotechnical applications.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures (44 h), group work (60 h) and independent work (31 h)

Target group:

Master students in the study option of Water and Geo Engineering

Prerequisites and co-requisites:

488115A Geomechanics

Recommended optional programme components:

-

Recommended or required reading:

Handout and other materials delivered in lectures

Assessment methods and criteria:

Written exam and exercises

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University teacher Anne Tuomela (substitute: researcher Anssi Rauhala)

Working life cooperation:

The course includes a visit to the Rusko waste center and also guest lectures from professionals in industry and administration.

Other information:

-

488127S: Field measurements, site investigations and geotechnical tests, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Ali Torabi Haghighi

Opintokohteen kielet: English

Leikkaavuudet:

488118S Laboratory Exercises and Field Measurements in Environmental Engineering 10.0 op

ECTS Credits:

5 ECTS /133 hours of work

Language of instruction:

English

Timing:

The course unit is given during periods 1 and 2

Learning outcomes:

Upon completion the student should be able to design field measurements and understand the quality of sampling and measurements in the field of environmental engineering. The student also improves skills of working in a team of fellow students to share expertise and execution responsibilities. The student understands the laboratory testing procedures and the associated parameters that help in estimating the soil mechanics and Geotechnical engineering and. The student knows how to use different methods for field measurement and sampling in water and geotechnical issues. The student can take considering the safety during the laboratory works and field measurements. After the course, the student can write detailed engineering reports.

Contents:

In the lectures: Units of measurements, error and mistake in laboratory works and field measurements, random and systematic error, precision and accuracy in laboratory work, planning field works, description of measuring site, securing results and material, sample preservation, subsoil exploration, direct & indirect methods of exploration, disturb and undisturbed samples, safety in field work, introduction on surveying, levelling, map and scale, different tests in soil mechanics laboratory.

Laboratory works in soil mechanics and geotechnical engineering: sieving test, hydrometer test, Atterberg limits test, proctor test, direct shear box test and oedometer test.

In the field: Working with GPS. Levelling and collecting data for preparing topography map. Soil sampling, surface water and groundwater sampling, Measuring velocity and discharge of river by using current meter and tracer.

Mode of delivery:

Face-to-face teaching, laboratory working

Learning activities and teaching methods:

Lectures (16 h), Fieldwork (20 h), Lab-work (9 h), Group work (88 h)

Target group:

Master students in the Water and Geo Engineering and Water and Environment study options

Prerequisites and co-requisites:

The required prerequisite is the completion of the following course prior to enrolling for the course unit:
488115A Geomechanics

Recommended optional programme components:

-

Recommended or required reading:

Field measurements and Laboratory work instruction, lecture materials

Assessment methods and criteria:

Two exams (40%), Report (50%) and assignments (10%), passing the exam is requirement for passing the course

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University Teacher Ali Torabi Haghighi

Working life cooperation:

No

Other information:

-

488151A: Basics of Traffic Engineering, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Virve Merisalo

Opintokohteen kielet: Finnish

Leikkaavuudet:

485401A Basics of Traffic Engineering 5.0 op

ECTS Credits:

5 ECTS / 133 h of work

Language of instruction:

Finnish

Timing:

The course unit is given in the autumn semester, during period 1

Learning outcomes:

By completing the course the student knows the basics of modes of transport, the significance of traffic and transportation to society, traffic planning and research methods, transport economics and the external effects of transport.

Contents:

Modes of transport, Need for traffic and transportation, Transport planning and research, Economical and environmental impacts of traffic, Traffic safety.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h, exercises 22 h, self-study 85 h

Target group:

Students in the Master's Programmes of environmental engineering and mechanical engineering

Prerequisites and co-requisites:

No

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time

Recommended or required reading:

Materials delivered during the lectures

Assessment methods and criteria:

Examination and exercises

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University teacher Virve Merisalo

Working life cooperation:

No

Other information:

-

488152S: Advanced Course in Traffic Engineering, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Virve Merisalo

Opintokohteen kielet: Finnish

Leikkaavuudet:

485402S Advanced Course in Traffic Engineering 5.0 op

ECTS Credits:

5 ECTS / 133 h of work

Language of instruction:

Finnish

Timing:

The course unit is given in the autumn semester, during period 2

Learning outcomes:

By completing the course the student understands the basics of transport policy and the significance of transport economics to society. The student becomes familiar with traffic safety and is able to analyse the problems of traffic safety and opportunity to improve it.

Contents:

Transport policy, transport economics, traffic safety

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h, exercises 22 h, self-study 85 h

Target group:

Students in the master's programmes of environmental engineering and mechanical engineering

Prerequisites and co-requisites:

488151A Basics of Traffic Engineering

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time

Recommended or required reading:

Materials delivered during the lectures

Assessment methods and criteria:

Examination and exercises

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University teacher Virve Merisalo

Working life cooperation:

No

Other information:

-

488153A: Basics of Road Engineering, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Virve Merisalo

Opintokohteen kielet: Finnish

Leikkaavuudet:

485403A Basics of Road Engineering 5.0 op

ECTS Credits:

5 ECTS / 133 h of work

Language of instruction:

Finnish

Timing:

The course unit is held in the spring semester, during period 3

Learning outcomes:

By completing the course the student understands the basics of road design and construction, is able to calculate structure layers of road and is familiar with the maintenance of roads

Contents:

Road and street planning and design, lining, roads structure, maintenance of roads, basics of earthworks

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h, exercises 22 h, self-study 85 h

Target group:

Students in master's programmes of environmental engineering and mechanical engineering

Prerequisites and co-requisites:

No

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time

Recommended or required reading:

Materials delivered during the lectures

Assessment methods and criteria:

Examination and exercises

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University teacher Virve Merisalo

Other information:

-

488154S: Road Design and Construction, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Virve Merisalo

Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS / 133 h of work

Language of instruction:

Finnish

Timing:

The course unit is held in the spring semester, during period 4

Learning outcomes:

By completing the course the student is familiar with road structure and function, structural modernisation, pavements and the basics of earthworks. He/she is also able to design road computer aided.

Contents:

Function of road structure, road damaging, structural modernisation, pavements, Road design and construction

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h, exercises 32 h, self-study 75 h

Target group:

Students in the master's programmes of environmental engineering and mechanical engineering

Prerequisites and co-requisites:

488153A Road Design and Construction, and 488051A AutoCAD and Matlab in process and environmental engineering

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time

Recommended or required reading:

Materials delivered during the lectures

Assessment methods and criteria:

Examination and exercises

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Yliopisto-opettaja Virve Merisalo

Other information:

-

466116S: Information modelling and automation in building construction and maintenance, 2,5 - 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Rauno Heikkilä

Opintokohteen kielet: Finnish

Leikkaavuudet:

485204S	Information modelling and automation in building construction and maintenance	5.0 op
460182S-01	Automation of Building and Bridge Construction, Examination	0.0 op
460182S-02	Automation of Building and Bridge Construction, Exercises	0.0 op
460182S	Automation of Building and Bridge Construction	5.0 op

ECTS Credits:

5 ECTS

Language of instruction:

Finnish

Timing:

Periods 3 and 4

Learning outcomes:

The course gives understanding about the possibilities of information modeling and automation in building construction, use and maintenance. Also it develops abilities to apply information modeling and automation in building construction and maintenance. Student will learn more about theories of information modeling and automation, different applications, software and systems, and possibilities of advanced information transferring techniques.

Contents:

Information modeling, automation and robotics in the initial data surveys, design, control of construction, as-built surveys and use and facilities management of buildings. 3-D coordinate systems in building construction process. Creation of measurement base for sites. 3-D measurement techniques and systems (robotic total station, UAS, 3-D fast surveying and modeling methods). Least squares optimization based redundancy and adjustment. Information modeling based design methods and software applications. Manufacturing automation in the factories for building components. Automated ground improvement methods and 3D-systems. Automated site construction systems and robots. Augmented reality methods and applications. Advanced maintenance methods and systems for buildings. Cloud based use and facilities management. 3-D city models. National and international Building Information Modeling (BIM) guidelines. Open information transfer formats and standards.

Learning activities and teaching methods:

Lectures, self study, excercises, site excursions, exam.

Prerequisites and co-requisites:

No specific prerequisites.

Recommended optional programme components:

Information modelling and automation in infrastructure construction and maintenance

Recommended or required reading:

Will be announced in the class.

Grading:

Opintojaksolla käytetään numeerista arviointiasteikkoa 1-5. Numeerisessa asteikossa nolla merkitsee hylättyä suoritusta.

Person responsible:

Professor Rauno Heikkilä

466115S: Information modelling and automation in infrastructure construction and maintenance, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Rauno Heikkilä

Opintokohteen kielet: Finnish

Leikkaavuudet:

485203A Information modelling and automation in infrastructure construction and maintenance
5.0 op

460180S-01 Automation of Road Construction, examination 0.0 op

460180S-02 Automation of Road Construction, exercises 0.0 op

460180S Automation of Road Construction 5.0 op

ECTS Credits:

5 ECTS

Language of instruction:

Finnish

Timing:

Periods 1 and 2

Learning outcomes:

The course gives understanding about the possibilities of information modeling and automation in infrastructure (roads, railways, fairways, tunnels, bridges) construction, use and maintenance. Also it develops abilities to apply information modeling and automation in infrastructure construction and maintenance. Student will learn more about theories of information modeling and automation, different applications, software and systems, and possibilities of advanced information transferring techniques.

Contents:

Information modeling and automation in the initial data surveying, design, machine and construction work process control, as-built surveys and maintenance of infrastructures. Ellipsoid and geodetic coordinate systems. Creation of 3-D measurement base for sites. Air based, mobile and ground based laser scanning methods and systems. Ground penetrating radar methods and systems. Least squares optimization based redundancy and adjustments. Information modeling based design methods and software applications. Guidance, control and autonomous machine control systems. Dynamic site control methods and systems. Augmented reality methods and applications in the infrastructure field. Advanced monitoring methods and systems. Information modeling based process, methods and systems in maintenance area. National and international information modeling guidelines (YIV2014, HB138, Bridge Information Modeling) for infrastructures. Open information transfer formats and international standards.

Mode of delivery:

Lectures, self study, excercises, site excursions, exam.

Learning activities and teaching methods:

Lectures, self study, excercises, site excursions, exam.

Target group:

Master Students of Mechanical Engineering

Prerequisites and co-requisites:

No specific perquisites.

Recommended optional programme components:

Information modelling and automation in building construction and maintenance

Recommended or required reading:

Will be announced in the class.

Assessment methods and criteria:

Passed practical works and exam

Grading:

The course utilizes a numerical grading scale 1-5. Numerical scale zero stands for a fail

Person responsible:

professor Rauno Heikkilä

477005S: Advanced Practical Training, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Practical training

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Hiltunen, Jukka Antero

Opintokohteen kielet: Finnish

Leikkaavuudet:

485002S	Advanced Practical Training	5.0 op
488002S	Advanced Practical Training	3.0 op
477002S	Advanced Practical Training	3.0 op

ECTS Credits:

5 ECTS (= min. 2 months working full-time)

Language of instruction:

Finnish or English

Timing:

Student usually works during the summer time between the 1st and 2nd academic year of the Master's degree.

Learning outcomes:

The objective is to get a deeper and more detailed conception of the industrial area where the student will possibly work after graduation. After the advanced practical training working period, the student is able to tell about their potential future jobs either in a new position or in an already familiar work environment. The student is able to identify and solve problems in work environment. Students are able to apply the theoretical knowledge they have learned in practical tasks. The student recognizes the diploma engineer's duties from his or her workplace.

Contents:

During the practical training the student will acquaint themselves with the working environment from the point of view of his/her studies and with another possible future job, or with a different assignment already in a familiar working environment. He/she can identify the problems of the working environment and can solve them. The student can apply his/her theoretical knowledge in practical tasks. He/she identifies the tasks appropriate for the Master of Science in Technology at his/her workplace.

Mode of delivery:

Practical training (internship) is usually carried out as a regular employee, to prepare the student for his/her possible future tasks in a leading, guiding, and/or planning position. In addition the student will be in touch with practical work and occupational safety issues, as well as the individual and social nature of the workplace. In addition to the training, the student is also required to prepare a CV and give a seminar presentation on his/her training.

Learning activities and teaching methods:

Students must find the training positions themselves. Suitable areas for practical training are, for example, regional environment centers, environmental engineering and consulting offices, water-works, biotechnological and food industry, chemical industry, pulp and paper industry, metallurgical and mining industry, partly electronics and automation industry, and other areas in the private and public sectors, e.g. supervision tasks and R&D tasks.

Target group:

Master's students in Process and Environmental Engineering

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Practical training as an employee (of minimally 2 months of full time work), and giving an oral seminar presentation to report the summer job. Student also has to show his/her original references (job certificates) and his/her cv, and submit an application form to the supervisor of the seminar. The reference must include the training period (from - to) and the duties. Advanced practical training cannot be substituted with jobs the student has performed before his/her Master's studies.

Grading:

Verbal scale Passed/Failed

Person responsible:

Jukka Hiltunen

Working life cooperation:

Yes

Other information:

-

460004S: Practical Training II, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Practical training

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Reijo Saari

Opintokohteen kielet: Finnish

Leikkaavuudet:

485002S Advanced Practical Training 5.0 op

460002S Practical Training II 3.0 op

Ei opintojaksokuvauksia.

A485246: Supplementary Module / Geo Engineering, 30 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Supplementary Module

Laji: Study module

Vastuuyksikkö: Civil Engineering field

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Free choice courses

461102A: Statics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Lahtinen, Hannu Tapio

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay461102A	Statics (OPEN UNI)	5.0 op
461016A-01	Statics, examination	0.0 op
461016A-02	Statics, exercises	0.0 op
461016A	Statics	5.0 op

ECTS Credits:

5 ETCS / 149 hours of work

Language of instruction:

Lectures in Finnish, foreign students follow the course by reading independently the books in English and taking part to the exercises and exams where all material is given in English.

Timing:

The course is held in the autumn semester, during periods 1 and 2. It is recommended to complete the course at the 1st autumn semester.

Learning outcomes:

After the course, the student can calculate forces and moments of loaded structures using equations of vector algebra and trigonometry. He/she can draw a free body diagram of the force system and then solve the unknown forces by using equations of equilibrium. He/she can determine resultants from uniformly distributed loads and apply Coulomb's law of friction in the problem equilibrium. The student can solve problems of internal and external forces of particle systems and rigid body systems in case of static equilibrium. Especially, he/she can draw shear force and bending moment diagrams for beam structures.

Contents:

Fundamental laws and concepts in statics. Force systems and their treatment. Equilibrium of particles and rigid bodies. Static forces in isostatic structures such as beams, frames, cables and trusses. Friction.

Mode of delivery:

Implemented as Face-to-face -teaching.

Learning activities and teaching methods:

Lectures 55 h / exercises 42 h / independent work of solving homework problems 52 h.

Target group:

Compulsory for candidate degree students of mechanical engineering programme.

Prerequisites and co-requisites:

Now prerequisites required.

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Salmi, T.: Statiikka, Pressus Oy, Tampere 2005; Beer, F., Johnston, R.: Vector Mechanics for Engineers, Statics, McGraw-Hill Book Company, 1996.

Assessment methods and criteria:

In the course acceptable homework and midterm exams / final exam are required. This course utilizes continuous assessment. There are four midterm exams, of which the last one is at the same time a final exam. Homework contain every week three problems that are marked. The student is allowed to participate to a final exam, when the homework is accepted.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University teacher Hannu Lahtinen

Other information:

The course gives ability for understanding static equilibrium, ability for determining force balance in structures and readiness for later studies.

461103A: Strength of materials I, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Lahtinen, Hannu Tapio

Opintokohteen kielet: Finnish

Leikkaavuudet:

461010A-01 Strength of Materials I, examination 0.0 op

461010A-02 Strength of Materials I, exercises 0.0 op

461010A Strength of Materials I 7.0 op

ECTS Credits:

5 ETCS / 149 hours of work

Language of instruction:

Lectures in Finnish, foreign students follow the course by reading independently the books in English and taking part to the exercises and exams where all material is given in English.

Timing:

The course is held in the spring semester, during periods 3 and 4. It is recommended to complete the course at the 1st spring semester.

Learning outcomes:

After the course, the student can determine stresses and strains of structures under loading. He/she can change the general stress and strain states from one coordinate system to another and can also apply constitutive equations in calculations. The student can dimension typical structures such as tension and compression bars, torsion bars and straight beams.

Contents:

Purpose and goals of strength of materials. Experimental elastic properties and strength of steel. Tension and compression of straight bars. Round torsion bar under shear force and torsion loads. Stresses and deflection curves in straight beams under bending moments. Stress state, strain state and constitutive equations, principal stresses, Mohr's circle. Stress hypotheses.

Mode of delivery:

Implemented as Face-to-face -teaching.

Learning activities and teaching methods:

Lectures 55 h / exercises 42 h / independent work of solving homework problems 52 h.

Target group:

Compulsory for Bachelor's degree students of mechanical engineering programme.

Prerequisites and co-requisites:

The recommended preceding course is 461102A Statics.

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time.

Recommended or required reading:

Salmi, T., Pajunen, S.: Lujuusoppi, Pressus Oy, Tampere, 2010, Pennala, E.: Lujuusopin perusteet, Moniste 407, Otatiето 2002; Karhunen, J. & al.: Lujuusoppi, Otatiето 2004; Beer, F., Johnston, E., Mechanics of materials, McGraw-Hill, 2011; Gere, J.M., Timoshenko, S.P., Mechanics of Materials, Chapman&Hall, 1991.

Assessment methods and criteria:

In the course acceptable homework and midterm exams / final exam are required. This course utilizes continuous assessment. There are four midterm exams, of which the last one is at the same time a final exam. Homework contain every week three problems that are marked. The student is allowed to participate to a final exam, when the homework is accepted.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University teacher Hannu Lahtinen

Other information:

The course looks into the most important principal concepts of strenght of materials and gives ability for dimensioning of simple structures such as straight bars in tension, compression or torsion loads and straight beams under bending moments.

466101A: Introduction to building construction, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Liedes, Hannu Tapani

Opintokohteen kielet: Finnish

Leikkaavuudet:

485101A	Introduction to building construction	5.0 op
460116A-01	Introduction to Contruction Engineering, examination	0.0 op
460116A-02	Introduction to Contruction Engineering, exercise work	0.0 op
460116A	Introduction to Building Construction	3.0 op

ECTS Credits:

5 ECTS credits / 132 hours of work

Language of instruction:

Finnish

Timing:

Spring, periods 3-4

Learning outcomes:

After completing the course students can describe the construction process, different parties of a construction project and their role in the project. Students can also explain how laws and legislation affects the construction, design and production of building structures. They can describe the material properties of the most common construction materials. They can also explain the certification process of a building material or product and the environmental legislation in construction.

Contents:

The following topics are covered during the course: Construction law and legislation. Different phases of a construction project. The raw materials, production and properties of the most common construction materials and products. Quality assurance and certification of building products. Environmental declarations. Life cycle assessment.

Mode of delivery:

Lecture room teaching.

Learning activities and teaching methods:

Lectures and exercises

Target group:

Students studying structural engineering

Recommended or required reading:

Lecture material. Land use and building legislation. The National Building Code of Finland

Assessment methods and criteria:

Passed practical works and exam

Grading:

The course utilizes a numerical grading scale 1-5. Numerical scale zero stands for a fail

Person responsible:

University teacher Hannu Liedes

466102A: Introduction to structural design, 3 - 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Liedes, Hannu Tapani

Opintokohteen kielet: Finnish

Leikkaavuudet:

485102A	Introduction to structural design	5.0 op
460117A-01	Introduction to Structural Design, examination	0.0 op
460117A-02	Introduction to Structural Design, exercise work	0.0 op
460117A	Introduction to Structural Design	6.0 op

ECTS Credits:

5 ECTS credits / 132 hours of work

Language of instruction:

Finnish

Timing:

Autumn semester, periods 1-2

Learning outcomes:

After completing the course the student is able to name technical regulations and instructions, which guide construction. After completing the course students can explicate principle of verifications and plastic theory on structure design and also different loads on structure. Student estimate design loads by calculation and design load effect in structures. Student can describe different structure and bracing systems.

Contents:

Regulations and supervising. The principle of design verification. The loads and effect. The principle of using of eurocode. The principle of plastic theory on on structure design. Structure systems. The joints of structures.

Mode of delivery:

Lecture room teaching.

Learning activities and teaching methods:

Lectures and exercises

Target group:

Students studying structural engineering

Prerequisites and co-requisites:

461016A Statics and 460101A Strength of Materials I

Recommended or required reading:

Lecture notes (mainly in Finnish), Finnish law and legislation, National building code of Finland, Eurocode standards

Assessment methods and criteria:

Passed practical works and exam

Grading:

Numerical grading scale 1-5. Grade 0 stands for a fail.

Person responsible:

University teacher Hannu Liedes

488123S: River Engineering and Hydraulic Structures, 5 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Ali Torabi Haghghi

Opintokohteen kielet: English

ECTS Credits:

5 ECTS /133 hours of work

Language of instruction:

English

Timing:

The course unit is held in the autumn semester during period 2

Learning outcomes:

Upon completion the student should be able to applied the pervious learned courses (open channel Hydraulics, fluid mechanics and hydrology) in hydraulic structures design and river engineering, cclassify the hydraulic structures, purposes and functions of them and design hydraulic structures using river analysis software. The student knows structures for flood protection.

Contents:

Review of hydrology, open channel hydraulics and fluid mechanics, General Requirements and Design Considerations, River geomorphology and river engineering, Flood, managing and damage assessment, Erosion and sediment transport in river, River analysis system by using Hec-Ras software, River stability and flood control structure, Conveyance structures, Water storage structures, Protective structures, Regulating structures, Water measurement structures, Energy Dissipaters, Design small hydraulic structures

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures (24 h), group work (36 h), independent work (29 h), self-study (29 h) and seminar (15 h)

Target group:

Students in Master programs of environmental engineering and civil engineering

Prerequisites and co-requisites:

The recommended prerequisite is the completion of the following course or having corresponding knowledge prior to enrolling for the course unit: 477052A Fluid mechanics and 488102A Hydrological Processes.

Recommended optional programme components:

The course 488113S Introduction to Surface Water Quality Modelling is recommended to take before this course unit

Recommended or required reading:

Novak, P., Moffat, A. Nalluri, C. and Narayanan, R., Hydraulic Structures, 3rd ed., 2001. U.S. Bureau of Reclamation, Design of Small Dams, U.S. Government Office, 1987. U.S. Bureau of Reclamation, Design of Small canal structures, U.S. Government Office, 1974. Lecture hand-outs.

Assessment methods and criteria:

Technical project (Using Hec-Ras for flood control Project) (30%), assignment (15%), river engineering report (15%), two exams (50%).

Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Professor Björn Klöve and University Teacher Ali Torabi Haghighi

Working life cooperation:

No

Other information:

The course is arranged in alternate years (even years in the autumn semester).

488139S: Surface water quality modelling, 5 op

Voimassaolo: 28.11.2016 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Anna-Kaisa Ronkanen

Opintokohteen kielet: English

ECTS Credits:

5 ECTS credits/133 hours of work

Language of instruction:

English

Timing:

The course is held in the autumn semester during the period 2

Learning outcomes:

After completing the course, the students are able to estimate point and diffusion load from catchment to lakes or rivers and are familiar with basic limnology of these water systems. The students are also able to analyse water systems using mathematical modelling and understand main pollutant transport mechanisms so that are able to model water quality in lakes and streams. They also understand key concepts of surface water systems, and how to control nutrient and pollutant processes. The students are able to use Matlab in environmental analysis, modeling and programming.

Contents:

Modelling in water resources planning, environmental hydraulics, open channel flow, diffusive and point loading, limnology, processes and water quality, dimensional analysis, hydraulic experiments, transport of conservative and reactive solutes in water bodies. Modelling with ordinary differential equations, fully mixed systems, analytical and numerical methods for surface water modelling. Parameter estimation and uncertainty.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 26 h / guided exercises by Matlab 16 h / self-studies 91 h. Totally 133 h.

Target group:

Master students in Water resources and environmental engineering major in the Environmental Engineering Master Program

Prerequisites and co-requisites:

Basic university level knowledge of mathematics and physics is required. The required prerequisite is also the completion of the following course prior to enrolling for the course unit: 488102A Hydrological Processes

Recommended optional programme components:

Matlab courses are recommended before the course unit.

Recommended or required reading:

Surface Water Quality Modelling (Chapra S, 1996, ISBN 0-0701-1-364-5). Fluvial Hydraulics: Flow and Transport Processes in Channels of Simple Geometry. (Walter HG, 1998, ISBN 0-0471-97714-4). Environmental Hydraulics of Open Channel Flows (Chanson H, 2004, ISBN 0-7506-6165-8). Lecture hand-outs and other materials delivered in lectures.

Assessment methods and criteria:

Totally 4 assignments and examination must be done and are graded on the scale 1-5. The final grade of the course is average grade of the exam and assignments.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University Lecturer Anna-Kaisa Ronkanen

Other information:

The course is arranged in alternate years (even years in the autumn semester).

492300A: Rock mechanics, 5 op

Voimassaolo: 01.08.2016 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Zongxian Zhang

Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS /133 hours of work

Language of instruction:

English

Timing:

3rd year 3rd period

Learning outcomes:

Upon completion of the course students should: (1) know the basic properties of rock; (2) be able to make stress or strain analysis to a rock sample and a rock structure; (3) be able to analyse rock failure under compression, shear and tension loads; (4) know which factors influence rock failure or fracture and know how those affect rock fracture; (5) know the basic principles and methods in rock support; (6) be able to do rock support design; (7) be able to apply rock mechanics theory to tunnelling, mining planning, rock drilling, rock excavation, slope engineering, and other rock-related engineering.

Contents:

The course will: (1) introduce basic properties and characteristics of rock and rock mass; (2) introduce stress analysis method; (3) present basic theory on rock failure or fracture; (4) introduce basic methods for measuring rock strengths (compressive, shear and tensile) in laboratory; (5) present methods for measuring in-situ stresses; (6) introduce methods for rock support; (7) give knowledge on how to apply rock mechanics to mining engineering and other types of rock engineering.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

Lectures, seminars, written reports, and assignments (mine visit if available).

Target group:

Students from mining and mineral processing, geophysics and geology

Recommended or required reading:

Brady BHG and Brown ET. Rock Mechanics for underground mining, third edition. New York: Kluwer Academic Publishers, 2004.

Goodman RE. Introduction to rock mechanics, second edition. New York: John Wiley & Sons, 1989.

Zhang ZX. Rock fracture and blasting: theory and applications. Oxford: Elsevier, 2016 (Chapters 1, 3-7, 10, 17-19, 21-24).

Assessment methods and criteria:

Assessment methods include oral presentations, written reports, seminars, assignments and written examination. The total points gained from the above determine the final grade of the course, and it is given on the scale Fail-1-5.

- For grade 1, the student must be able to know and understand the basic knowledge in this course.
- For grade 2, the student must know how to make stress analysis and rock failure analysis.
- For grade 3 the student must be able to make a plan for rock support.
- For grade 4, the student must be able to make a plan for rock support and evaluate such a plan.
- For grade 5, the student must be able to apply the acquired knowledge to make a very good plan for mining and rock engineering operation by using rock mechanics. He or she must do an outstanding design in at least one aspect, e.g. he/she can find a problem related rock mechanics or rock fracture and know how to solve the problem or how to make improvement.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Zongxian Zhang

Working life cooperation:

No

Other information:

-

488153A: Basics of Road Engineering, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Virve Merisalo

Opintokohteen kielet: Finnish

Leikkaavuudet:

485403A Basics of Road Engineering 5.0 op

ECTS Credits:

5 ECTS / 133 h of work

Language of instruction:

Finnish

Timing:

The course unit is held in the spring semester, during period 3

Learning outcomes:

By completing the course the student understands the basics of road design and construction, is able to calculate structure layers of road and is familiar with the maintenance of roads

Contents:

Road and street planning and design, lining, roads structure, maintenance of roads, basics of earthworks

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h, exercises 22 h, self-study 85 h

Target group:

Students in master's programmes of environmental engineering and mechanical engineering

Prerequisites and co-requisites:

No

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time

Recommended or required reading:

Materials delivered during the lectures

Assessment methods and criteria:

Examination and exercises

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University teacher Virve Merisalo

Other information:

-

488152S: Advanced Course in Traffic Engineering, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Virve Merisalo

Opintokohteen kielet: Finnish

Leikkaavuudet:

485402S Advanced Course in Traffic Engineering 5.0 op

ECTS Credits:

5 ECTS / 133 h of work

Language of instruction:

Finnish

Timing:

The course unit is given in the autumn semester, during period 2

Learning outcomes:

By completing the course the student understands the basics of transport policy and the significance of transport economics to society. The student becomes familiar with traffic safety and is able to analyse the problems of traffic safety and opportunity to improve it.

Contents:

Transport policy, transport economics, traffic safety

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h, exercises 22 h, self-study 85 h

Target group:

Students in the master's programmes of environmental engineering and mechanical engineering

Prerequisites and co-requisites:

488151A Basics of Traffic Engineering

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time

Recommended or required reading:

Materials delivered during the lectures

Assessment methods and criteria:

Examination and exercises

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University teacher Virve Merisalo

Working life cooperation:

No

Other information:

-

A460256: Supplementary Module/Structural Engineering and Construction Technology, 25 op

Voimassaolo: 01.08.2016 -

Opiskelumuoto: Supplementary Module

Laji: Study module

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Ch

466106S: Advanced topics on design of steel structures, 6 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Kangaspuoskari, Matti Johannes

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay466106S	Advanced topics on design of steel structures (OPEN UNI)	6.0 op
460128S-01	Advanced Course in Design of Steel Structures I, examination	0.0 op
460128S-02	Advanced Course in Design of Steel Structures I, exercise work	0.0 op
460128S	Advanced Topics on Design of Steel Structures I	4.0 op

ECTS Credits:

6 ECTS

Language of instruction:

Finnish

Timing:

Periods 3 and 4

Learning outcomes:

After completing the course the student is capable of explain the performance and design principles of welded steel structures exposed to fatigue loading. He is able to design the plated structural elements and cold-formed members. He is able to analyze and design a steel frame. He is able to analyze dynamically loaded structures and can explain the effect of vibration on steel structures strength and reliability.

Contents:

The following topics are covered during the course: Steel structure under fatigue load. Fracture toughness. Stability and bracing of a steel frame building. Fire design. Plated structural elements with stiffeners. Elements resistance to transverse forces. Cold-formed members. Mechanical vibrations. Seismic design. Chimneys. Crane supporting structures. Accidental design situations and progressive collapse.

Mode of delivery:

Face-to-face.

Learning activities and teaching methods:

Lectures and exercises 52 h. Self-study 110 h. Total 162 h = 6 ECTS Credits.

Target group:

Major students in Structural Engineering, Mashine design, and Engineering Mechancs. 466102A

Prerequisites and co-requisites:

460117A Introduction to Structural Design and 466105S Design of Steel Structures. Key notes in courses Statics, Strength of Materials I, Strength of Materials II, Mechanics of materials and Mechanical Vibrations.

Recommended or required reading:

Lecture notes (in Finnish). Eurocodes 1990-1999.

Assessment methods and criteria:

Three midterm exams or one final exam is required. One design exercise is required.

Grading:

The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Matti Kangaspuoskari

466108S: Advanced topics on design of concrete structures, 6 op**Voimassaolo:** 01.08.2015 -**Opiskelumuoto:** Advanced Studies**Laji:** Course**Vastuuyksikkö:** Field of Mechanical Engineering**Arvostelu:** 1 - 5, pass, fail**Opettajat:** Antti Niemi**Opintokohteen kielet:** Finnish**Leikkaavuudet:**

485116S	Advanced topics on design of concrete structures	5.0 op
460149S	Advanced Topics on Design of Concrete Structures I	4.0 op
460149S-01	Advanced Course in Design of Concrete Structures I, examination	0.0 op
460149S-02	Advanced Course in Design of Concrete Structures I, exercises	0.0 op

ECTS Credits:

6 ECTS / 162 hours

Language of instruction:

Finnish

Timing:

Lectures and exercising on periods 1 and 2.

Learning outcomes:

Upon completion of the course, the student will be able to design reinforced concrete slabs and pre-stressed concrete beam structures to EN standards.

Contents:

Limit state design of concrete slabs and flat slabs. Limit state design of pre-stressed concrete beam structures. Fire design. Design of concrete elements. Stability and stiffening of the concrete frame in the building.

Mode of delivery:

face-to-face teaching.

Learning activities and teaching methods:

Lectures and exercising 54 hours including personal and team work. Self-reliant studying and homework 108 hours.

Target group:

Master level students focusing on structural engineering and design.

Prerequisites and co-requisites:

Recommended good skills in: 466107S Design of concrete structures. Statics, strength of materials, structural mechanics of beam, plate and shell structures. Basics in concrete technology and structural design.

Recommended or required reading:

Nykyri: BY211 Betonirakenteiden suunnittelun oppikirja, osa 1, 2013 ja osa 2, 2015; Leskelä: By210 Betonirakenteiden suunnittelu ja mitoitus 2008; By60 Suunnitteluohje EC2 osat 1-1 ja 1-2, 2008; EN 1992-1-1, EN 1992-1-2 (ja muut EN-standardit tarvittavilta osin); BY51 Betonirakenteiden käyttöikäsuunnittelu 2007; BY47 Betonirakentamisen laatuohjeet 2007; RIL 229-2-2006 Rakennesuunnittelun asiakirjaohje, Mallipiirustukset ja -laskelmat; By47 Betonirakentamisen laatuohjeet 2007; RIL202-2012 Betonirakenteiden suunnitteluohje. Martin, Purkiss: Concrete design to EN 1992, Elsevier, 2nd ed. 2006. Lecture and exercise materials.

Assessment methods and criteria:

Continuous assessment. The course can be completed by participating in intermediate exams during the course, or in final exam. Assessment criteria are based on the learning outcomes of the course.

Grading:

The course utilises a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

university teacher Raimo Hannila, LSc (tech.)

Other information:

The real-time qualifications for A and AA level structural designers in Finland should be checked out at: Rakennus-, LVI- ja kiinteistöalan henkilöpätevyudet FISE Oy, <http://www.fise.fi/>.

466110S: Advanced topics on concrete technology, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jorma Hopia

Opintokohteen kielet: Finnish

Leikkaavuudet:

485115S Advanced topics on concrete technology 5.0 op

485115S	Advanced topics on concrete technology	5.0 op
460156S-01	Advanced Course in Concrete Technology I, examination	0.0 op
460156S-02	Advanced Course in Concrete Technology I, laboratory exercises	0.0 op
460156S	Advanced Topics Concrete Technology I	4.0 op

ECTS Credits:

5 ECTS credits / 132 hours of work

Language of instruction:

Finnish

Timing:

Autumn semester, periods 1-2

Learning outcomes:

After completing the course the student is able to manage the goal of the subject by broadening the knowledge to new concrete types and their design methods, testing and application conditions and also on concrete with special properties such as e.g. high-quality, high strength and self-compacting. He can also explain how to assess the structural condition of concrete.

Contents:

Durability and defects of concrete structures, high-strength concrete, self-compacting concrete. Processing of secondary raw materials for the preparation of special concrete, utilization of fly ash, slag and dust.

Mode of delivery:

Face-to-face and distance learning

Learning activities and teaching methods:

Lectures, excercises, case studies, laboratory sessions and self directed learning

Target group:

Students studying structural engineering

Prerequisites and co-requisites:

466109S Concrete technology

Recommended or required reading:

The material that is in English will be distributed at the lectures 1) Lecture notes (mainly in Finnish) 2) BY 42, betonijulkisivun kuntotutkimus 2002, Suomen Betoniyhdistys. 3) BY 41, betonirakenteiden korjausohjeet, 2007, Suomen Betoniyhdistys. 4) IVO-B-13/91. 1991. Korkealujuusbetoni, uusi materiaali voimalaitosrakentamiseen, A. Ipatti. Imataran Voima Oy. 5) Itsetiivistyvä betoni, 2004, Suomen Betonitieto Oy. 6) Suomen betoniyhdistys. Betoninormit 2004 : BY 50. Helsinki : Suomen betonitieto. 7) BY 51, betonirakenteiden käyttöikäsuunnittelu 2007. Suomen Betoniyhdistys

Assessment methods and criteria:

Passed laboratory excercises and exam

Grading:

Numerical grading scale 1-5. Grade 0 stands for a fail.

Person responsible:

Raimo Hannila

466112S: Advanced topics on building physics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Filip Fedorik

Opintokohteen kielet: English

Leikkaavuudet:

485113S Advanced topics on building physics 5.0 op

ECTS Credits:

5 ECTS credits / 132 hours of work

Language of instruction:

English

Timing:

Autumn, periods 1-2

Learning outcomes:

After completing the course the student can explain the different physical phenomena that affect the temperature and moisture behaviour of different structures. He can also study numerically the building-physical behaviour of structures and structural systems. He can use different software to simulate the behaviour and solve problems. He can assess the potential mould risk of structure based on temperature and relative humidity values measured on site.

Contents:

Computational modelling and analysis methods of building-physical behavior of structures. Site measurements. Mould index.

Mode of delivery:

Face-to-face and distance learning

Learning activities and teaching methods:

Lectures, excercises, case studies and self directed learning

Target group:

Students studying structural engineering

Prerequisites and co-requisites:

466101A Introduction to building construction, 466111S Building physics

Recommended or required reading:

The material that is in English will be distributed at the lectures

Assessment methods and criteria:

Excercises and homework

Grading:

Numerical grading scale 1-5. Grade 0 stands for a fail.

Person responsible:

Filip Fedorik

466115S: Information modelling and automation in infrastructure construction and maintenance, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Rauno Heikkilä

Opintokohteen kielet: Finnish

Leikkaavuudet:

485203A Information modelling and automation in infrastructure construction and maintenance
5.0 op

460180S-01 Automation of Road Construction, examination 0.0 op

460180S-02 Automation of Road Construction, excercises 0.0 op

460180S Automation of Road Construction 5.0 op

ECTS Credits:

5 ECTS

Language of instruction:

Finnish

Timing:

Periods 1 and 2

Learning outcomes:

The course gives understanding about the possibilities of information modeling and automation in infrastructure (roads, railways, fairways, tunnels, bridges) construction, use and maintenance. Also it develops abilities to apply information modeling and automation in infrastructure construction and maintenance. Student will learn more about theories of information modeling and automation, different applications, software and systems, and possibilities of advanced information transferring techniques.

Contents:

Information modeling and automation in the initial data surveying, design, machine and construction work process control, as-built surveys and maintenance of infrastructures. Ellipsoid and geodetic coordinate systems. Creation of 3-D measurement base for sites. Air based, mobile and ground based laser scanning methods and systems. Ground penetrating radar methods and systems. Least squares optimization based redundancy and adjustments. Information modeling based design methods and software applications. Guidance, control and autonomous machine control systems. Dynamic site control methods and systems. Augmented reality methods and applications in the infrastructure field. Advanced monitoring methods and systems. Information modeling based process, methods and systems in maintenance area. National and international information modeling guidelines (YIV2014, HB138, Bridge Information Modeling) for infrastructures. Open information transfer formats and international standards.

Mode of delivery:

Lectures, self study, excercises, site excursions, exam.

Learning activities and teaching methods:

Lectures, self study, excercises, site excursions, exam.

Target group:

Master Students of Mechanical Engineering

Prerequisites and co-requisites:

No specific perquisites.

Recommended optional programme components:

Information modelling and automation in building construction and maintenance

Recommended or required reading:

Will be announced in the class.

Assessment methods and criteria:

Passed practical works and exam

Grading:

The course utilizes a numerical grading scale 1-5. Numerical scale zero stands for a fail

Person responsible:

professor Rauno Heikkilä

466116S: Information modelling and automation in building construction and maintenance, 2,5 - 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Rauno Heikkilä

Opintokohteen kielet: Finnish

Leikkaavuudet:

485204S Information modelling and automation in building construction and maintenance 5.0 op

460182S-01	Automation of Building and Bridge Construction, Examination	0.0 op
460182S-02	Automation of Building and Bridge Construction, Exercises	0.0 op
460182S	Automation of Building and Bridge Construction	5.0 op

ECTS Credits:

5 ECTS

Language of instruction:

Finnish

Timing:

Periods 3 and 4

Learning outcomes:

The course gives understanding about the possibilities of information modeling and automation in building construction, use and maintenance. Also it develops abilities to apply information modeling and automation in building construction and maintenance. Student will learn more about theories of information modeling and automation, different applications, software and systems, and possibilities of advanced information transferring techniques.

Contents:

Information modeling, automation and robotics in the initial data surveys, design, control of construction, as-built surveys and use and facilities management of buildings. 3-D coordinate systems in building construction process. Creation of measurement base for sites. 3-D measurement techniques and systems (robotic total station, UAS, 3-D fast surveying and modeling methods). Least squares optimization based redundancy and adjustment. Information modeling based design methods and software applications. Manufacturing automation in the factories for building components. Automated ground improvement methods and 3D-systems. Automated site construction systems and robots. Augmented reality methods and applications. Advanced maintenance methods and systems for buildings. Cloud based use and facilities management. 3-D city models. National and international Building Information Modeling (BIM) guidelines. Open information transfer formats and standards.

Learning activities and teaching methods:

Lectures, self study, excercises, site excursions, exam.

Prerequisites and co-requisites:

No specific prerequisites.

Recommended optional programme components:

Information modelling and automation in infrastructure construction and maintenance

Recommended or required reading:

Will be announced in the class.

Grading:

Opintojaksolla käytetään numeerista arviointiasteikkoa 1-5. Numeerisessa asteikossa nolla merkitsee hylättyä suoritusta.

Person responsible:

Professor Rauno Heikkilä

466118S: Advanced topics on structural engineering and construction technology, 5 - 10 op**Voimassaolo:** 01.08.2015 -**Opiskelumoto:** Advanced Studies**Laji:** Course**Vastuuyksikkö:** Field of Mechanical Engineering**Arvostelu:** 1 - 5, pass, fail**Opintokohteen kielet:** Finnish

Ei opintojaksokuvauksia.

488111S: Modelling in Geoenvironmental Engineering, 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Anssi Rauhala

Opintokohteen kielet: Finnish

Leikkaavuudet:

485305S Modelling in Geoenvironmental Engineering 5.0 op

ECTS Credits:

5 ECTS credits/133 hours of work

Language of instruction:

Finnish

Timing:

The course unit is given in the spring semester, during period 4

Learning outcomes:

After the course the student can apply the numerical calculation methods in design and dimensioning of earth and geoenvironmental structures. The student can evaluate the influence of boundary conditions and material parameters in calculation results.

Contents:

Contaminant transport. Design and dimensioning of piles, tailings and dams structures. Settlement calculation due to different load types. Calculating the earth pressure of retaining walls. Freezing and thawing of earth structures. Geotechnical design of pile foundation.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures (10 h), design (58 h) and modelling assignments (65 h).

Target group:

Master's students in the study option of Water and Geoenvironmental Engineering

Prerequisites and co-requisites:

The required prerequisite: 488115A Geomechanics. Also recommended: 488051A AutoCAD and Matlab in Process and Environmental Engineering, 488121S Fundamentals of Civil Engineering, 488129S Foundation Engineering, 488131S Geoenvironmental Engineering.

Recommended optional programme components:

-

Recommended or required reading:

Lecture handout and other materials delivered in lectures

Assessment methods and criteria:

Passing the course requires solving the given assignments and writing reports about them. The assignments are solved with computer modelling, which requires constant participation to the lectures.

Grading:

The course utilizes verbal grading scale pass/fail.

Person responsible:

University teacher Anne Tuomela (substitute: researcher Anssi Rauhala)

Working life cooperation:

The course includes guest lectures from an international consulting and engineering company.

Other information:

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488121S: Fundamentals of Civil Engineering, 5 op**Voimassaolo:** 01.08.2011 -**Opiskelumuoto:** Advanced Studies**Laji:** Course**Vastuuyksikkö:** Field of Process and Environmental Engineering**Arvostelu:** 1 - 5, pass, fail**Opettajat:** Anssi Rauhala**Opintokohteen kielet:** Finnish**ECTS Credits:**

5 ECTS credits/133 hours of work

Language of instruction:

Finnish

Timing:

The course unit is held in the autumn semester, during period 1

Learning outcomes:

The student knows how to calculate stability and settlement of municipal earth structures, design the structures against frost depth and frost heave and evaluate the needs for soil improvement. The student knows risks of the excavations and slopes and can design those using mathematical theories.

Contents:

Norms and instructions, basis of geotechnical design, earth and road structures, properties of soil material and industrial by-products, soil improvement, excavations, Property and surface drainage, lowering of groundwater table. Pipeline Construction. Specialities of railway construction and vibration problems.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures (34 h) and design and calculation exercises (10 h) also self-study (91 h)

Target group:

Master students in the Water and Geo Engineering study option of the Environmental Engineering program

Prerequisites and co-requisites:

Prerequisites: 488115A Geomechanics, 477032A AutoCAD and Matlab in process and environmental engineering (or similar AutoCAD knowledge)

Recommended optional programme components:

-

Recommended or required reading:

Handout and other materials delivered in lectures

Assessment methods and criteria:

Examination and homeworks

Read more about [assessment criteria](#) at the University of Oulu webpage.**Grading:**

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University teacher Anne Tuomela (substitute: researcher Anssi Rauhala)

Working life cooperation:

The course includes guest lectures from various sectors of civil engineering.

Other information:

-

488127S: Field measurements, site investigations and geotechnical tests, 5 op**Voimassaolo:** 01.08.2015 -**Opiskelumuoto:** Advanced Studies**Laji:** Course**Vastuuyksikkö:** Field of Process and Environmental Engineering**Arvostelu:** 1 - 5, pass, fail**Opettajat:** Ali Torabi Haghghi**Opintokohteen kielet:** English**Leikkaavuudet:**

488118S Laboratory Exercises and Field Measurements in Environmental Engineering 10.0 op

ECTS Credits:

5 ECTS /133 hours of work

Language of instruction:

English

Timing:

The course unit is given during periods 1 and 2

Learning outcomes:

Upon completion the student should be able to design field measurements and understand the quality of sampling and measurements in the field of environmental engineering. The student also improves skills of working in a team of fellow students to share expertise and execution responsibilities. The student understands the laboratory testing procedures and the associated parameters that help in estimating the soil mechanics and Geotechnical engineering and. The student knows how to use different methods for field measurement and sampling in water and geotechnical issues. The student can take considering the safety during the laboratory works and field measurements. After the course, the student can write detailed engineering reports.

Contents:

In the lectures: Units of measurements, error and mistake in laboratory works and field measurements, random and systematic error, precision and accuracy in laboratory work, planning field works, description of measuring site, securing results and material, sample preservation, subsoil exploration, direct & indirect methods of exploration, disturb and undisturbed samples, safety in field work, introduction on surveying, levelling, map and scale, different tests in soil mechanics laboratory.

Laboratory works in soil mechanics and geotechnical engineering: sieving test, hydrometer test, Atterberg limits test, proctor test, direct shear box test and oedometer test.

In the field: Working with GPS. Levelling and collecting data for preparing topography map. Soil sampling, surface water and groundwater sampling, Measuring velocity and discharge of river by using current meter and tracer.

Mode of delivery:

Face-to-face teaching, laboratory working

Learning activities and teaching methods:

Lectures (16 h), Fieldwork (20 h), Lab-work (9 h), Group work (88 h)

Target group:

Master students in the Water and Geo Engineering and Water and Environment study options

Prerequisites and co-requisites:

The required prerequisite is the completion of the following course prior to enrolling for the course unit:
488115A Geomechanics

Recommended optional programme components:

-

Recommended or required reading:

Field measurements and Laboratory work instruction, lecture materials

Assessment methods and criteria:

Two exams (40%), Report (50%) and assignments (10%), passing the exam is requirement for passing the course

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University Teacher Ali Torabi Haghighi

Working life cooperation:

No

Other information:

-

488131S: Geoenvironmental Engineering, 5 op

Voimassaolo: 01.08.2013 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Anssi Rauhala

Opintokohteen kielet: Finnish

Leikkaavuudet:

485306S Geoenvironmental Engineering 5.0 op

ECTS Credits:

5 ECTS credits/133 hours of work

Language of instruction:

Finnish and option complete in English

Timing:

The course unit is held in the autumn semester during period 1

Learning outcomes:

The student knows norms and instruction which are related to contaminated sites. The students can choose the suitable remediation technique for contaminated soil. The student can calculate contaminant transport in soils. The student can also design geotechnical structures of industrial and domestic landfills and evaluate the needs for remediation of contaminated soils. Student know how to used by-products from industry in different applications.

Contents:

Norms and instructions, there will be a project work where student will be discover a contaminated soil and a proposal remediation technique, Properties of soil material and industrial by-products, basis of geotechnical design to landfill environment, Structures of dams and inpondments, Challenges of mining, Remote sensing as a part of geotechnical applications.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures (44 h), group work (60 h) and independent work (31 h)

Target group:

Master students in the study option of Water and Geo Engineering

Prerequisites and co-requisites:

488115A Geomechanics

Recommended optional programme components:

-

Recommended or required reading:

Handout and other materials delivered in lectures

Assessment methods and criteria:

Written exam and exercises

Read more about [assessment criteria](#) at the University of Oulu webpage.**Grading:**

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University teacher Anne Tuomela (substitute: researcher Anssi Rauhala)

Working life cooperation:

The course includes a visit to the Rusko waste center and also guest lectures from professionals in industry and administration.

Other information:

-

488151A: Basics of Traffic Engineering, 5 op**Voimassaolo:** 01.08.2015 -**Opiskelumuoto:** Intermediate Studies**Laji:** Course**Vastuuyksikkö:** Field of Process and Environmental Engineering**Arvostelu:** 1 - 5, pass, fail**Opettajat:** Virve Merisalo**Opintokohteen kielet:** Finnish**Leikkaavuudet:**

485401A Basics of Traffic Engineering 5.0 op

ECTS Credits:

5 ECTS / 133 h of work

Language of instruction:

Finnish

Timing:

The course unit is given in the autumn semester, during period 1

Learning outcomes:

By completing the course the student knows the basics of modes of transport, the significance of traffic and transportation to society, traffic planning and research methods, transport economics and the external effects of transport.

Contents:

Modes of transport, Need for traffic and transportation, Transport planning and research, Economical and environmental impacts of traffic, Traffic safety.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h, exercises 22 h, self-study 85 h

Target group:

Students in the Master's Programmes of environmental engineering and mechanical engineering

Prerequisites and co-requisites:

No

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time

Recommended or required reading:

Materials delivered during the lectures

Assessment methods and criteria:

Examination and exercises

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University teacher Virve Merisalo

Working life cooperation:

No

Other information:

-

488152S: Advanced Course in Traffic Engineering, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Virve Merisalo

Opintokohteen kielet: Finnish

Leikkaavuudet:

485402S Advanced Course in Traffic Engineering 5.0 op

ECTS Credits:

5 ECTS / 133 h of work

Language of instruction:

Finnish

Timing:

The course unit is given in the autumn semester, during period 2

Learning outcomes:

By completing the course the student understands the basics of transport policy and the significance of transport economics to society. The student becomes familiar with traffic safety and is able to analyse the problems of traffic safety and opportunity to improve it.

Contents:

Transport policy, transport economics, traffic safety

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h, exercises 22 h, self-study 85 h

Target group:

Students in the master's programmes of environmental engineering and mechanical engineering

Prerequisites and co-requisites:

488151A Basics of Traffic Engineering

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time

Recommended or required reading:

Materials delivered during the lectures

Assessment methods and criteria:

Examination and exercises

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University teacher Virve Merisalo

Working life cooperation:

No

Other information:

-

488153A: Basics of Road Engineering, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Virve Merisalo

Opintokohteen kielet: Finnish

Leikkaavuudet:

485403A Basics of Road Engineering 5.0 op

ECTS Credits:

5 ECTS / 133 h of work

Language of instruction:

Finnish

Timing:

The course unit is held in the spring semester, during period 3

Learning outcomes:

By completing the course the student understands the basics of road design and construction, is able to calculate structure layers of road and is familiar with the maintenance of roads

Contents:

Road and street planning and design, lining, roads structure, maintenance of roads, basics of earthworks

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h, exercises 22 h, self-study 85 h

Target group:

Students in master's programmes of environmental engineering and mechanical engineering

Prerequisites and co-requisites:

No

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time

Recommended or required reading:

Materials delivered during the lectures

Assessment methods and criteria:

Examination and exercises

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

University teacher Virve Merisalo

Other information:

-

488154S: Road Design and Construction, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Virve Merisalo

Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS / 133 h of work

Language of instruction:

Finnish

Timing:

The course unit is held in the spring semester, during period 4

Learning outcomes:

By completing the course the student is familiar with road structure and function, structural modernisation, pavements and the basics of earthworks. He/she is also able to design road computer aided.

Contents:

Function of road structure, road damaging, structural modernisation, pavements, Road design and construction

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h, exercises 32 h, self-study 75 h

Target group:

Students in the master's programmes of environmental engineering and mechanical engineering

Prerequisites and co-requisites:

488153A Road Design and Construction, and 488051A AutoCAD and Matlab in process and environmental engineering

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time

Recommended or required reading:

Materials delivered during the lectures

Assessment methods and criteria:

Examination and exercises

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

Yliopisto-opettaja Virve Merisalo

Other information:

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485991S: Master's Thesis Seminar, 0 op**Voimassaolo:** 01.08.2017 -**Opiskelumuoto:** Advanced Studies**Laji:** Course**Vastuuyksikkö:** Civil Engineering field**Arvostelu:** 1 - 5, pass, fail**Opintokohteen kielet:** Finnish

Ei opintojaksokuvauksia.

485999S: Master's Thesis in Civil Engineering, 30 op**Voimassaolo:** 01.08.2017 -**Opiskelumuoto:** Advanced Studies**Laji:** Diploma thesis**Vastuuyksikkö:** Civil Engineering field**Arvostelu:** 1 - 5, pass, fail**Opintokohteen kielet:** Finnish

Ei opintojaksokuvauksia.

485990S: Maturity Test, Civil Engineering, 0 op**Voimassaolo:** 01.08.2017 -**Opiskelumuoto:** Advanced Studies**Laji:** Course**Vastuuyksikkö:** Civil Engineering field**Arvostelu:** 1 - 5, pass, fail**Opintokohteen kielet:** Finnish

Ei opintojaksokuvauksia.

Tutkintorakenteisiin kuulumattomien opintokokonaisuuksien ja -jaksojen kuvaukset**485402S: Advanced Course in Traffic Engineering, 5 op****Voimassaolo:** 01.08.2019 -**Opiskelumuoto:** Advanced Studies**Laji:** Course**Vastuuyksikkö:** Civil Engineering field**Arvostelu:** 1 - 5, pass, fail**Opintokohteen kielet:** Finnish

Leikkaavuudet:

488152S Advanced Course in Traffic Engineering 5.0 op

Ei opintojaksokuvauksia.

485403A: Basics of Road Engineering, 5 op

Voimassaolo: 01.08.2019 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Civil Engineering field

Arvostelu: 1 - 5, pass, fail

Opettajat: Veikko Pekkala

Opintokohteen kielet: Finnish

Leikkaavuudet:

488153A Basics of Road Engineering 5.0 op

Ei opintojaksokuvauksia.

488132S: Cold Climate Engineering, 5 op

Voimassaolo: 01.08.2013 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Kauko Kujala

Opintokohteen kielet: English

Leikkaavuudet:

485307S Cold Climate Engineering 5.0 op

Ei opintojaksokuvauksia.