Opasraportti

Open University - Engineering, manufacturing and construction (2021 - 2022)

Studying in the Open University

Open University offers courses in six fields of the faculties of the University of Oulu and the Language Centre of the University of Oulu. You may complete basic and intermediate studies as well as language and communication studies. The instruction is in line with the basic instruction offered to degree students at the University of Oulu in terms of quality, content, and learning outcomes. The Open University provides the chance to study regardless of your age or prior education.

To get the Open University study right you must register to the course/module and pay the tuition fees. Please note that study right may be longer than the time required to take the course. Informations about study right and time limitations can be found from WebOodi.

Completing entire degrees at the Open University is not possible. You may only complete parts of a degree that may later be included in your university degree if you are accepted into a university as a basic degree student.

The information about the courses, timetables and registration can be found from https://www.oulu.fi/joy/

For more information please contact avoin.yliopisto@oulu.fi

The Open University reserve the right to make changes.

Tutkintorakenteisiin kuulumattomat opintokokonaisuudet ja -jaksot

555391S: Advanced Course in Project Management, 5 op
485402S: Advanced Course in Traffic Engineering, 5 op
ay485111S: Advanced Topics on Structural Timber Design (OPEN UNI), 5 op
466106S: Advanced topics on design of steel structures, 6 op
780660S: Advanced water treatment chemistry, 5 op
771117P: Basic course in mineralogy, 5 op
485412A: Basics of Road Engineering I, 2 op
485413A: Basics of Road Engineering II, 3 op
485410A: Basics of Traffic Engineering I, 2 op
485411A: Basics of Traffic Engineering II, 3 op
485202S: Building information modeling, 5 op
485103A: Building physics, 5 op
555393S: Capstone project: project management in different industries, 5 op
555392S: Change Project and Programme Management, 5 op
477204S: Chemical Engineering Thermodynamics, 5 op
477123S: Chemical processing of biomasses, 5 op
ay780397A: Chemistry for Teachers (OPEN UNI), 5 op
ay782338A: Chemistry in Industrial Applications (OPEN UNI), 5 op
466105S: Design of Steel Structures, 6 op
488507S: Energy Systems Engineering, 5 op

ay488231S: Environmental Chemistry and Ecology (OPEN UNI), 5 op
ay781309A: Environmental Chemistry for Chemistry Teachers, 5 op
488143S: Environmental Impact Assessment, 5 op
488142A: Environmental legislation and EIA, 5 op
477502A: Experiment design and analysis, 5 op
477052A: Fluid Mechanics, 5 op
485308S: Foundation Engineering, 5 op
485302A: Foundation Engineering, 5 op
485304S: Fundamentals of Civil Engineering, 5 op
488212A: Fundamentals of catalysis, 5 op
780117P: General and Inorganic Chemistry A, 5 op
780118P: General and Inorganic Chemistry B, 5 op
485306S: Geoenvironmental Engineering, 5 op
477417S: High temperature chemistry, 5 op
477416S: High temperature processes, 5 op
451535P: History of Architecture I, lecture course, 4 op
451537A: History of Architecture II, lecture course, 3 op
451504A: History of Architecture III, 3 op
488102A: Hydrological Processes, 5 op
450547A: Indesign Basics, 1 op
ayA440190: Industrial Engineering and Management (IEM) Minor Subject Studies (OPEN UNI), 25 op
Compulsory
ay555225P: Basics of industrial engineering and management (OPEN UNI), 5 op
ay555285A: Project management (OPEN UNI), 5 op
ay555268P: Basic course in well-being and safety at work (OPEN UNI), 5 op
ay555286A: Process and quality management (OPEN UNI), 5 op
ay555242A: Product development (OPEN UNI), 5 op
488215S: Industry and Environment, 5 op
477129S: Inorganics Materials in Circular Economy, 5 op
771113P: Introduction to Geology I, 5 op
771114P: Introduction to Geology II, 5 op
780116P: Introduction to Organic Chemistry, 5 op
771116P: Introduction to Quaternary deposits of Finland and their resources, 5 op
771115P: Introduction to bedrock geology of Finland and ore geology, 5 op
ay780173P: Introduction to green chemistry (OPEN UNI), 2 op
491101P: Introduction to mining, 5 op
491102P: Introduction to solid earth geophysics, 5 op
485102A: Introduction to structural design, 5 op
555382S: Management of a project-based firm, 5 op
477323A: Mass and Heat Transfer, 5 op
ay477231A: Material and Energy Balances I (OPEN UNI), 2 op
ay477232A: Material and Energy Balances II (OPEN UNI), 3 op
477124S: Mechanical processing of biomasses, 5 op
461108A: Mechanics of materials, 5 op
ay452561S: Modern Wood Architecture (OPEN UNI), 7 op
485121S: Numerical methods in structural engineering, 5 op
450541A: Photoshop, Advanced Photomanipulation, 2 op
493300A: Principles of mineral processing, 5 op
492601A: Principles of mining engineering, 5 op
477524S: Process Optimization, 5 op
477501A: Process dynamics, 5 op
477222A: Reactor Analysis, 5 op
488209S: Renewable Energy, 5 op
485404S: Road Design and Construction, 5 op
492300A: Rock mechanics, 5 op
477304A: Separation Processes, 5 op
485303A: Soil Mechanics, 5 op
488213A: Sources and control of air pollution, 5 op
461102A: Statics, 5 op
461011A: Strength of Materials II, 7 op
461103A: Strength of materials I, 5 op
488506S: Sustainable Urban Energy, 5 op
477401A: Thermodynamic Equilibria, 5 op
455511P: Visual Arts I, 5 op

455512P: Visual Arts II, 3 op
488110S: Water and Wastewater Treatment, 5 op

Opintojaksojen kuvaukset

Tutkintorakenteisiin kuulumattomien opintokokonaisuuksien ja -jaksojen kuvaukset

555391S: Advanced Course in Project Management, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Jere Lehtinen
Opintokohteen kielet: English
Leikkaavuudet:

555381S Project Leadership 5.0 op

ECTS Credits:
5 ECTS credits.

Language of instruction:
English.

Timing:
Period 2.

Learning outcomes:
Upon completion of the course, the student will be able to:

- explain and describe the most important project management areas and tools
- identify and evaluate the most applicable managerial approaches for different types of projects
- identify development needs and opportunities in project-based organisations
- to develop project management processes in an organisation

Contents:
different type of projects and industry specific approaches to project management, agile project management, managing large international projects, project governance, project risk and uncertainty management, project time and schedule management, management of innovative projects.
Mode of delivery:
The tuition will be implemented as blended teaching (web-based teaching and face-to-face teaching).

Learning activities and teaching methods:
Lectures, web-based-lectures and workshops 26h, group exercises and cases 66h, self-study 42h.

Target group:
Industrial Engineering and Management students.

Prerequisites and co-requisites:
555288A Project Management
Recommended optional programme components:
-
Recommended or required reading:

Lecture materials and reading materials (articles, book chapters) related to each lecture.

Assessment methods and criteria:
This course utilises continuous assessment. The grading is based on case assignments solved in groups and discussed during the lecture, and group assignment that is presented and discussed in the workshops. Since the implementation of the cases and group work vary, the assessment methods and criteria will be defined at the beginning of the course.

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

Person responsible:
D.Sc. Jere Lehtinen
Working life cooperation:
The course includes guest lectures from industry.

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

Opettajat: Virve Merisalo

Opintokohteen kielet: Finnish

Leikkaavuudet:

488152S Advanced Course in Traffic Engineering 5.0 op

ECTS Credits:
5 ECTS / 135 h of work
Language of instruction:
Finnish
Timing:
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 Programme of Civil Engineering
Prerequisites and co-requisites:
-
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:
Yes

Other information:
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ay485111S: Advanced Topics on Structural Timber Design (OPEN UNI), 5 op

Voimassaolo: 01.08.2021 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: University of Oulu, Open University
Arvostelu: 1 - 5, pass, fail
Opetus suunnattu: University of Oulu, Open University
Opintokohteen kielet: Finnish
Leikkaavuudet:

485111S Advanced Topics on Structural Timber Design 5.0 op

ECTS Credits:
5 ETCS / 135 hours of work
Language of instruction:
Finnish
Learning outcomes:

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:
The student can explain the basics of fatigue design of a welded structure. The student is able to design sheet metal structures and welded plate beam structures. He / she is able to analyze and design steel structures and their joints. They are able to analyze dynamically loaded structures and to evaluate the effect of vibrations on the functionality and usability of structures.
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:
Degree students who study steel structure design.
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

780660S: Advanced water treatment chemistry, 5 op

Voimassaolo: 01.08.2018 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Chemistry

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

ECTS Credits:
5 ECTS credits / 134 hours of work
Language of instruction:
Finnish and English
Timing:
Implementation as a net course, available in optional schedule (net tutors not available in July). Deadline for course materials created by student within 2 months from beginning. When starting course, contact anne.heponiemi@oulu.fi or sari.tuomikoski@oulu.fi to get the rights to Moodle workspace.
Learning outcomes:
After this course, student:
- knows legislation requirements and suggestions for municipal domestic water and wastewater in Finland
- knows water and wastewater treatment unit operations, chemical reactions and phenomena concerning to the treatment
- has created comprehensive dictionary regarding to municipal domestic and wastewater treatment
Contents:
Legislation concerning to the municipal domestic water and wastewater treatment and physical, chemical and biological unit operations as a treatment method. Case studies from municipal domestic water and wastewater treatment.
Mode of delivery:
Net course
Learning activities and teaching methods:
134 hours of self-study
Target group:
Chemistry, process and environmental engineering, open university, further education
Prerequisites and co-requisites:
General and inorganic chemistry A (780117P) and B (780118P) (or same knowledge).
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:
Finlex Legislation https://www.finlex.fi/en/
Letterman R.D, Water quality and treatment, fifth edition, American water works association, McGraw-Hill handbooks.
Metcalf and Eddy. Wastewater Engineering: treatment and reuse. 4. painos, Boston, McGraw-Hill, 2003.
RIL 124-1-2003 Vesihuolto I ja II, editor Karttunen E.

Scientific articles
Assessment methods and criteria:
Passing the course includes exploring to domestic and wastewater treatment technologies in Finland and the preparation of wide terminology regarding to water treatment. Course includes also the filling preliminary knowledge template and the final feedback of the course. Course work will be returned to Moodle workspace. In addition to the contents, the quality of the references and the layout of the work will be taken into account during evaluation.
Grading:
The course utilizes a numerical grading scale 0-5. In the numerical scale zero stands for a fail.
Person responsible:
Anne Heponiemi, Sari Tuomikoski
Working life cooperation:
No

771117P: Basic course in mineralogy, 5 op

Voimassaolo: 01.08.2017 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Oulu Mining School
Arvostelu: 1 - 5, pass, fail
Opettajat: Pekka Tuisku
Opintokohteen kielet: Finnish

ECTS Credits:
5 ects
Person responsible:
Pekka Tuisku

485412A: Basics of Road Engineering I, 2 op

Voimassaolo: 01.08.2021 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Civil Engineering field
Arvostelu: 1 - 5, pass, fail
Opettajat: Veikko Pekkala
Opintokohteen kielet: Finnish

ECTS Credits:
2 ECTS credits / 54 hours of work
Language of instruction:
Finnish
Timing:
The course unit is held in the spring semester during period 3
Learning outcomes:
After completing the course, the student understands the importance of the road network to society. The student recognizes the structures of the road and their function. The student is able to determine the steps of the road planning process. The student knows the basic principles of road cross-section and geometry design.
Contents:
The road network and its importance, road structure, road design process, road cross section and geometry.
Mode of delivery:
Online course
Learning activities and teaching methods:
Self-study 54 h
Target group:
Students in bachelor's program of civil engineering
Prerequisites and co-requisites:

The course is an independent entity and does not require additional studies carried out at the same time.
Recommended or required reading:
Materials delivered in lectures
Assessment methods and criteria:
Videolectures and approved assignments
Grading:
Pass/fail
Person responsible:
Veikko Pekkala
Other information:
Courses 485412A (Basics of Road Engineering I, 2 ECTS credits) and 485413A (Basics of Road Engineering II, 3 ECTS credits) will together replace course 485403A (Basics of Road Engineering, 5 ECTS credits).

485413A: Basics of Road Engineering II, 3 op

Voimassaolo: 01.08.2021 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Civil Engineering field

Arvostelu: 1 - 5, pass, fail

Opettajat: Veikko Pekkala

Opintokohteen kielet: Finnish

ECTS Credits:
3 ECTS credits / 81 hours 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 students understand the basic principles of road design and know how to size the road structure. Students know the importance of road care and maintenance for road life cycles.
Contents:
Planning, sizing and drainage of the road structure. Road management and maintenance, ground-building basics.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 17 h, exercises 13 h, self-study 51 h
Target group:
Students in bachelor's program of civil engineering
Prerequisites and co-requisites:
The course is an independent entity and does not require additional studies carried out at the same time.
Recommended optional programme components:
Materials delivered in lectures
Recommended or required reading:
Materials delivered in lectures
Assessment methods and criteria:
Exam and assignment(s)
Grading:
The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
Veikko Pekkala
Working life cooperation:
Yes
Other information:
Courses 485412A (Basics of Road Engineering I, 2 ECTS credits) and 485413A (Basics of Road Engineering II, 3 ECTS credits) will together replace course 485403A (Basics of Road Engineering, 5 ECTS credits).

485410A: Basics of Traffic Engineering I, 2 op

Voimassaolo: 01.08.2021 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Civil Engineering field

Arvostelu: 1 - 5, pass, fail

Opettajat: Virve Merisalo

Opintokohteen kielet: Finnish

ECTS Credits:
2 ECTS credits / 54 hours of work
Language of instruction:
Finnish
Timing:
The course unit is held in the autumn semester during period 1
Learning outcomes:
After completing the course, students know the basics of different modes of transport, the importance of transport in society and the functioning of the transport system.
Contents:
Modes of transport, Need for traffic and transportation, Transportation system
Mode of delivery:
E-learning
Learning activities and teaching methods:
Self-study 54 h
Target group:
Students in bachelor's program of civil 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 in the course
Assessment methods and criteria:
Video lectures and approved tasks
Grading:
The course is assessed as pass/fail
Person responsible:
Virve Merisalo
Working life cooperation:
No
Other information:
Courses 485410A Basics of Transport Engineering I (2 ECTS) and 485420A Basics II (3 ECTS) replace the earlier course 485401A Basics of Transport Engineering (5 ECTS).

485411A: Basics of Traffic Engineering II, 3 op

Voimassaolo: 01.08.2021 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Civil Engineering field

Arvostelu: 1 - 5, pass, fail

Opettajat: Virve Merisalo

Opintokohteen kielet: Finnish

ECTS Credits:
3 ECTS credits / 81 hours of work
Language of instruction:
Finnish
Timing:

The course unit is held in the autumn semester during period 1
Learning outcomes:
After completing the course, students will know the basics of transport planning and research methods, smart traffic systems and the external effects of transport.
Contents:
Traffic flow, Traffic studies, models and forecasts, Transport planning, Smart traffic, Environmental impacts of transport, Traffic safety.
Mode of delivery:
Face-to-face teaching.
Learning activities and teaching methods:
Letures 14 h, exercises 4 h, self-study 63 h
Target group:
Students in bachelor's program of civil engineering
Prerequisites and co-requisites:
The course may be attended after completing the course 485410A Basics of Transport Engineering I.
Recommended or required reading:
Materials delivered in lectures
Assessment methods and criteria:
Exam and assignment(s)
Grading:
The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
Virve Merisalo
Other information:
Courses 485410A Basics of Transport Engineering I (2 ECTS) and 485420A Basics Transport Engineering II (3 ECTS) replace the earlier course 485401A Basics of Traffic Engineering (5 ECTS).

485202S: Building information modeling, 5 op

Voimassaolo: 01.08.2020 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Civil Engineering field

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

466114S	Building information modeling	5.0 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, excercises 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:
Partisipation to lectures and exercises
Grading:

Pass or fail.
Person responsible:
Jorma Hopia

485103A: Building physics, 5 op

Voimassaolo: 01.08.2019 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Civil Engineering field
Arvostelu: 1 - 5, pass, fail
Opettajat: Filip Fedorik
Opintokohteen kielet: English
Leikkaavuudet:

466111S	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:
English
Timing:
Autumn, Periods 1-2
Learning outcomes:
After completing the course, the student is familiar with the physical conditions of the indoor environment. The student knows the key building physics consepts and definitions as well as the humidity sources buildings, the mechanisms for moisture transfer and normal moisture content in different structures. The student knows the importance of thermal insulation, air tightness and sound insulation and can interpret the measurement results. The student can explain the basic phenomena and key concepts of building physics in such a way that he/she is able to analyze and present the transfer of heat, air and humidity in structures, and explain the causes of typical moisture damage. 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) Finnish building code as applicable.
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:
Filip Fedorik
Other information:
This course will replace course 466111S Building Physics in Academic year 2020-21.

555393S: Capstone project: project management in different industries, 5 op

Voimassaolo: 01.08.2021 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Kirsi Aaltonen, Jaakko Kujala

Opintokohteen kielet: English

ECTS Credits:
5 ECTS cr
Language of instruction:
English
Timing:
Period 4
Learning outcomes:
Upon completion, the student is able to:

- Identify and solve project management problems in practice
- Communicate the solutions efficiently and effectively
- Describe the distinctive features and practices of different project-based industrie (such as construction and iTC sector) and has familiarized oneself with the methods and tools in the projects in one selected industry context
- Tell about the global trends of different project-based industries

Contents:
The course focuses on real-life project management challenges in different project-based industry contexts (such as construction industry, ICT industry, and industrial engineering sector). The student may select one spesific industry as a context in which he or she applies project management knowledge and skills to solve practical project management problems. In addition, the course introduces students to the management practices and distinctive features of different industries, and discusses their recent project management developments. The course also features visiting industry lecturers and international researchers focused in these contexts.
Mode of delivery:
The tuition will be implemented primarily as online teaching.
Learning activities and teaching methods:
Online lectures and workshops including visiting lecturers 20 h, assignments and group work 72 h, self-study 42 h.
Target group:
Industrial Engineering and Management students.
Prerequisites and co-requisites:
555285A Projektinhallinta/ 555288A Project Management, 555391S Advanced Course in Project Management, 555382S Management of Project-Based Firm
Recommended optional programme components:
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Recommended or required reading:
Lecture materials and reading materials (articles, book chapters) related to each lecture.
Assessment methods and criteria:
This course utilizes continuous assessment. The grading is based on real-life assignments that are solved. In the individual assignment the student will focus on project management practices in one specific industry. The detailed assessment methods and criteria will be explained at the beginning of the course.
Grading:
1 - 5, pass, fail
Person responsible:
Associate professor Kirsi Aaltonen, Professor Jaakko Kujala
Working life cooperation:
The course includes guest lectures from industry.

555392S: Change Project and Programme Management, 5 op

Voimassaolo: 01.08.2021 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Kirsi Aaltonen, Jaakko Kujala

Opintokohteen kielet: English

ECTS Credits:
5 ECTS cr
Language of instruction:
English
Timing:
Period 1
Learning outcomes:
Upon completition, the student is

- Explain key concepts and features of organizational change, change projects and programmes
- Understand and evaluate the role of change projects and programmes in implementing organizational change as well as management of grand challenges
- Develop practical approaches and processes to managing change projects and programmes and to use these as vehicles for managing the grand challenges
- Evaluate, analyze and distinguish between approaches and processes to managing real-life change projects and programmes

In addition, the students will be trained in the following generic skills:

- Information searching skills
- Problem-solving skills
- Team workability
- Written and oral presentation skills
- Argumentation and opposing skills
- Ability give, receive and deal with feedback
- Ability to work against deadlines

Contents:
The purpose of the course is to provide students with a holistic understanding of the key themes and frameworks in change project and programme management and with practical considerations and guidelines necessary for managing change in organizations through projects and programmes. Furthermore, the role of programme and project management in the management of the grand challenges of the society (such as climate change) is addressed.
Mode of delivery:
The tuition will be implemented primarily as online teaching.
Learning activities and teaching methods:
Online lectures and workshops including visiting lecturers 20 h, assignments and group work 72 h, self-study 42 h.
Target group:
Industrial Engineering and Management students.
Prerequisites and co-requisites:
555285A Projektinhallinta/ 555288A Project Management
Recommended optional programme components:
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Recommended or required reading:
Lecture materials and reading materials (articles, book chapters) related to each lecture.
Assessment methods and criteria:
This course utilizes continuous assessment. The grading is based on different individual and group assignments. The detailed assessment methods and criteria will be explained at the beginning of the course.
Grading:
1 - 5, pass, fail
Person responsible:
Associate professor Kirsi Aaltonen, Professor Jaakko Kujala
Working life cooperation:
The course includes guest lectures from industry.

477204S: Chemical Engineering Thermodynamics, 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Tanskanen, Juha Petri

Opintokohteen kielet: Finnish

ECTS Credits:
5 ECTS /135 hours of work
Language of instruction:
Finnish
Timing:
Period 1 (autumn term)
Learning outcomes:
By completing the course, the student understands classical thermodynamics from a chemical engineering viewpoint. Especially she/he can explain the pVT behaviour of pure substances and understands the thermodynamic properties of mixtures. The student can classify the thermodynamic models describing, for example, liquid mixtures. The student can select appropriate models for gas, vapour and liquid phases. In addition, the student can solve process models, phase equilibrium and chemical reaction equilibrium problems, and more generally, is able to evaluate chemical processes using thermodynamic analysis tools.
Contents:
Mass and energy balances, pVT behaviour of pure substances, thermodynamic properties of fluids, chemical reaction equilibrium, vapour/liquid equilibrium, introduction to the use of Aspen Plus in the calculation of a thermodynamic equilibrium state, calculation of thermodynamical state functions, thermodynamic analysis of processes.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 46 h and self-study 87 h
Target group:
Students in the study options of Chemical Engineering, and Bioproducts and bioprocesses.
Prerequisites and co-requisites:
Essential contents of 477401A Thermodynamic equilibria course, or equivalent knowledge on the basic concepts of thermodynamic equilibria.
Recommended or required reading:
Lecture handout. Material given during the lectures.
Additional literature, Smith, J.M. & Van Ness, H.C.: Introduction to Chemical Engineering Thermodynamics. McGraw-Hill, 2005. (7th ed.) ISBN 0-07-124708-4
Assessment methods and criteria:
Combination of a final exam and home 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:
Professor Juha Tanskanen
Working life cooperation:
No

477123S: Chemical processing of biomasses, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Elisa Koivuranta

Opintokohteen kielet: English

Leikkaavuudet:

477104S Chemical Processing of Biomasses 3.0 op

ECTS Credits:
5 ECTS /133 h of work
Language of instruction:
English
Timing:
Implementation in autumn period 1
Learning outcomes:
Upon completion of the course, a student should be able to explain the value chain of chemical processing of renewable lignocellulosic raw materials to pulp and different end-products. A student is able to identify lignocellulosic raw material sources, their properties, their main components and utilization potential of components. The student also identifies the unit operations of chemical pulping processes, can explain their operational principles and their objectives in the kraft pulping process and their role in end product properties.
Contents:
Lignocellulosic raw materials, fundamentals of chemical pulping and other chemical processing methods, recovering of chemicals in kraft pulping, fiberline in kraft pulping, side products and environmental aspects.
Mode of delivery:
Blended teaching.
Learning activities and teaching methods:
Lectures max. 20 h, homework and self-study 113 hours
Target group:
Students interested in bioproduct industry and lignocellulose materials.
Prerequisites and co-requisites:
It is recommended that students is familiar with the structure and the main properties of lignocellulosic materials.
Recommended or required reading:
Book series: Fapet Oy. Papermaking Science and Technology, book 6: Chemical pulping Part 1 and Part 2, book 20: Biorefining of Forest Resources.
Lecture materials and other materials that will be announced at the lectures.
Assessment methods and criteria:
This course utilizes continuous assessment including intermediate exam with web learning and homework. Read more about the course assessment and grading systems of the University of Oulu at https://www.oulu.fi/forstudents/assesment-criteria

Grading:
The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
Elisa Koivuranta
Other information:
Language of instruction English, assignments and exam is also possibility to do in Finnish.

ay780397A: Chemistry for Teachers (OPEN UNI), 5 op

Voimassaolo: 01.08.2019 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: University of Oulu, Open University

Arvostelu: 1 - 5, pass, fail

Opetus suunnattu: University of Oulu, Open University

Opintokohteen kielet: Finnish

Leikkaavuudet:

780397A Chemistry for Teachers 5.0 op

ECTS Credits:
5 credits / 135 hours of work
Language of instruction:
Finnish
Timing:
Spring term
Learning outcomes:

After this course the student should understand the importance of the experiments in the teaching of chemistry. Student should also be able to design demonstrations and laboratory experiments suitable in different levels of learning.
Contents:
The course familiarize the students with the experimental works in the schools. Basic concepts in chemistry are revised in the same time.
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:
Material handed out by the teacher and course members.
Assessment methods and criteria:
Practical laboratory work and home work done and reported.
Grading:
The course utilizes verbal grading scale pass/fail.
Person responsible:
Teija Kangas

ay782338A: Chemistry in Industrial Applications (OPEN UNI), 5 op

Voimassaolo: 01.08.2019 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: University of Oulu, Open University
Arvostelu: 1 - 5, pass, fail
Opetus suunnattu: University of Oulu, Open University
Opintokohteen kielet: Finnish
Leikkaavuudet:

782338A Chemistry in Industrial Applications 5.0 op

ECTS Credits:
5
Language of instruction:
Finnish

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
485108A Desing of Steel Structures and Steel Construction 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 able to explain the basic nature of the crystalline structure of steel and its elastomeric material model. He / she is able to evaluate the effect of alloys, heat treatment and welding on the mechanical properties of steel. He / she can explain what happens to steel in the event of a fire and the basics of fire design. The student is able to design the joints of a steel structure frame and can dimension the steel structure under different load combinations. He / she is able to analyze stability problems and can explain inaccuracies and second order effects.
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:
Degree students who study steel structure design.

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
Other information:
Course 485108A replaces this course in academic year 2021-2022.

488507S: Energy Systems Engineering, 5 op

Voimassaolo: 01.08.2019 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Eva Pongracz

Opintokohteen kielet: English

ECTS Credits:
5 cr/135 hours of work
Language of instruction:
English
Timing:
Autumn, period 1
Learning outcomes:
After the course, the student is familiar with the measures and dimensions of macro-level energy production and consumption. The student will know the energy measures and able to apply correctly the units of energy. The student will gain fluency in finding, downloading, processing and visualizing energy statistics. The student will

know the expectations from energy conversion and distribution systems, energy storage systems, and the management of the efficient use of energy in buildings, manufacturing, and processing systems. The student will also understand the seasonality of different energy needs and energy generation from renewable energy sources (RES) as well as will be able to calculate the required size of installations that can cover the energy needs of different targets. The student will also gain understanding of the secondary effects of energy usage from a local environmental impact, regional and national economic impact, and global climate change perspective. The student can also calculate total net energy needs, total energy from RES, % of total net energy covered by RES, total balance in primary energy units. The student can also correctly apply EROI calculations for different energy generation and storage technologies.

Contents:
The structure and domains of the power system types of power plants, transmission and distribution networks. Energy production measures and dimensions, seasonality and intermittancy. Energy measures and units, primary and secondary energy, sizing calculations for energy generation for centralized and decentralized solutions. Energy storage capacities, scales, sizing for short- and long-term options. Primary and secondary environmental impacts of energy production; land-use impacts and footprint-based calculations. EROI and net energy, footprint calculations and land-use impacts.

Mode of delivery:
Face-to-face teaching; the course has compulsory participation requirements.

Learning activities and teaching methods:
Lectures 36h; work assignment; continuous evaluation.

Target group:
Master’s students of environmental engineering, especially of energy and environmental engineering orientation; Master’s students in economics; Master’s students of Electrical Engineering and Information Technology. Doctoral students are also welcome to participate.

Prerequisites and co-requisites:
The course is designed to be accessible to students with the broadest background. Nevertheless, a scientific and /or technical background is an advantage.

Recommended or required reading:
Lecture slides and information on recommended reading material will be provided during the course.

Assessment methods and criteria:
The course evaluation will be based on the grades of inrermediate tasks.

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

Person responsible:
Prof. Eva Pongrácz

ay488231S: Environmental Chemistry and Ecology (OPEN UNI), 5 op

Voimassaolo: 01.01.2019 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: University of Oulu, Open University

Arvostelu: 1 - 5, pass, fail

Opetus suunnattu: University of Oulu, Open University

Opintokohteen kielet: English

Leikkaavuudet:

488231S Environmental Chemistry and Ecology 5.0 op

ECTS Credits:
5 ECTS credits / 135 hours of work

Language of instruction:
English

Timing:
A 10 week intensive course is arranged twice per year: in the autumn semester and in the spring semester. For further information concerning the schedule please contact the teachers.

Learning outcomes:
Upon completion of the course, the student has an understanding of the multidisciplinary nature and concept of the current environmental problems through the lens of (1) environmental chemistry and (2) environmental ecology. In addition, the student is able to consider how the circular economy tools can be applied to prevent and minimize environmental impacts.

Contents:
A project work focusing on four major environmental concerns is done in groups of 4-5 students. In addition to the project work, there are individual course tasks.
Mode of delivery:
Online studies.
Learning activities and teaching methods:
Project work 100 h / Self-study 35 h
Target group:
Students in all disciplines
Assessment methods and criteria:
Project work and individual tasks will be assessed. Assessment criteria are based on the learning outcomes of the course. Read more about the course assessment and grading systems of the University of Oulu at www.oulu.fi /english/studying/assessment.
Grading:
The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
University lecturer Minna Tiainen and university teacher Virpi Väisänen

ay781309A: Environmental Chemistry for Chemistry Teachers, 5 op

Voimassaolo: 01.08.2020 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: University of Oulu, Open University

Arvostelu: 1 - 5, pass, fail

Opetus suunnattu: University of Oulu, Open University

Opintokohteen kielet: Finnish

Leikkaavuudet:

781309A Environmental Chemistry 5.0 op

ECTS Credits:
5 ECTS credits / 135 hours of work
Language of instruction:
Finnish
Timing:
The course is held in the autumn semester
Learning outcomes:
Upon completion the student should have understanding of twelve principles of green chemistry. The student should have acquired an understanding of chemistry of atmosphere, hydrosphere and terrestrial environment. The student is acquainted with the limitations of the use of dangerous chemicals and is able to find updated information of them.
Contents:
Fundamentals of environmental chemistry; chemistry of the soil, natural and waste waters and atmosphere, circulation of chemical compounds in the nature, chemical releases, environmentally toxic and other noxious compounds, environmental analytics and basics of physical measurements. Environmental friendly chemistry.
Mode of delivery:
Web-based teaching, with face-to-face meetings at the beginning and end of the course
Learning activities and teaching methods:
50 hours of the activating learning methods, portfolio work 20h, self-study 64 h. During the course, participants will design and implement a teaching session with materials distributed to all participants.
Target group:
Open university students. The course is aimed at secondary school and high school natural science teachers, the course is also suitable for biology and geography teachers.
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:
van Loon, G.W. & Duffy, S.J.: Environmental Chemistry, A Global Perspective, Oxford, 2000; Lancaster M.: Green Chemistry: An introductory text, RSC, 2002.
Assessment methods and criteria:
Portfolio and project work

Grading:
The course utilizes verbal grading scale “Pass/ Fail”
Person responsible:
Minna Tiainen
Working life cooperation:
Students can use their outputs in their own teaching work

488143S: Environmental Impact Assessment, 5 op

Voimassaolo: 28.11.2016 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Hannu Marttila

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 1.
Learning outcomes:
The student will acquire a broad and multidisciplinary and sustainable approach to environmental impact assessment (EIA). The student will know the all steps in EIA process and the different methods used in environmental impact assessment. During the course students develop their working life skills (e.g. writing, communication skills) and the ability to review environmental problems. Thy also learn how to resolve extensive environmental projects related problems, causes and consequences.

Contents:
EIA process and legislation, environmental change, principles and assessment methods in ecology, hydrology, economics, energy issues and social sciences.

Mode of delivery:
Face-to-face teaching, video lectures and project works.
Learning activities and teaching methods:
The amount of lecture hours can varied depending teaching resources in every year but independent project working is the main activities in the course. Work load in the course is totally 133 h. The project work is completed as group or individual work.

Target group:
Only master students in Water resources and Environmental Engineering major in the Environmental Engineering Master Program.

Recommended or required reading:
Environmental Impact Assessment: Cutting Edge for the Twenty-First Century (Gilpin A, 1995, ISBN 0-521-42967-6). Lecture hand-outs and other materials delivered in lectures.

Assessment methods and criteria:
The assignment (100 %). More information about assessment methods is given during the course.

Grading:
The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
Assistant Professor Hannu Marttila
Working life cooperation:
The course includes the video guest lectures from local companies and authorities. The assignment is based on case studies that are real on-going or passed EIA projects.

Other information:
Maximum number of the students in the course is 20.

488142A: Environmental legislation and EIA, 5 op

Voimassaolo: 28.11.2016 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Process and Environmental Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Heini Postila
Opintokohteen kielet: Finnish
Leikkaavuudet:

454541A	Built Environment	5.0 op
485022A	Fundamentals of built environment	5.0 op

ECTS Credits:
5 ECTS credits / 133 hours of work
Language of instruction:
Finnish
Timing:
The course is held in the spring semester during the period 4.
Contents:
Finnish law, EU directives.
Mode of delivery:
Face-to-face teaching and independent work with selected projects.

Learning activities and teaching methods:
Lectures 24 h /seminars 4 h / independent work with project topic. Totally 133 h. The project work are completed as a group work.
Target group:
Students in the bachelor programs of Environmental Engineering, Civil Engineering and Architecture.

Recommended or required reading:

Assessment methods and criteria:
Project report (40%), seminar presentation (40%) and learning diaries (20%).
Grading:
The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:
Postdoctoral researcher Heini postila (Environmental Engineering), Professor Tarja Outila (Architecture) and University teacher Hannu Liedes (Civil Engineering).
Working life cooperation:

Other information:

477502A: Experiment design and analysis, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Aki Sorsa

Opintokohteen kielet: Finnish

Leikkaavuudet:

470432A Process Control Engineering II 5.0 op

ECTS Credits:
5 ECTS /135 hours of work
Language of instruction:
Finnish
Timing:
Implementation in the 4th period on the spring term.
Learning outcomes:
After the course, the student knows different experimental design methods and their applicability for different problems. He can also design experiments for multi-variable processes and analyze the results. He can also use some basic means to visualize the results got from experimental data and choose proper tools for experiment design problems.
Contents:
Systematic design of process experiments with matrix techniques (Hadamard, Central Composite Design). Graphical and statistical analysis of experimental data. Correlation, regression and variance analysis.
Mode of delivery:
Lectures and extensive exercise work
Learning activities and teaching methods:
Lectures during one period
Target group:
Bachelor's students in Process and Environmental Engineering
Prerequisites and co-requisites:
No course requirements.
Mathematics related to statistical tests and regression model identification is used. Mathematics is not specifically taught during the course and thus, if needed, students must independently obtain the information needed.
Recommended optional programme components:
The course forms a basis to the advanced courses in the field of control engineering.
Recommended or required reading:
Reading materials.
Additional literature: Diamond W.J.: Practical Experiment Designs. Lifetime Learning Publications. Belmont, California, 1981. 348 pp.
Assessment methods and criteria:
Homework and written/oral test. It is recommended to take the course also according to the principle of continuous evaluation.

Grading:
The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Read more about assessment criteria at the University of Oulu webpage.
Person responsible:
Aki Sorsa
Working life cooperation:
No

477052A: Fluid Mechanics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Ainassaari, Kaisu Maritta

Opintokohteen kielet: Finnish

Leikkaavuudet:

477301A Momentum Transfer 3.0 op

ECTS Credits:
5 ECTS / 133 hours of work.
Language of instruction:
Finnish, can be completed in English as a book examination.
Timing:
Implementation in spring semester during 3 rd period. It is recommended to complete the course at the second (Bachelolor's) spring semester.
Learning outcomes:
After the course the student is able to determine the viscosity of pure substances and mixtures and to estimate the effect of temperature and pressure on viscosity. The student is able to recognise the interactions between a solid body and flowing fluid and to distinguish the forces, their directions and to calculate their magnitudes. The student is able to formulate momentum balance equations and to solve these in order to calculate velocity distribution, flow rate and pressure drop. The student is able to distinguish laminar and turbulent flow regimes from others and is able to use the correct equations according to flow regime. After the course the student is able to design pipelines and other simple flow mechanical process equipment.
Contents:
Viscosity. Mechanism of momentum transfer. Creating and solving differential momentum balances. Friction factor. Flow in pipes and open-channels.
Mode of delivery:
Face-to-face teaching in Finnish. Book examination in English.
Learning activities and teaching methods:
Lectures 45 h, homework 15 h and self-study 73 h. For foreign students written examination based on given literature.
Target group:
Bachelor's degree students of process and environmental engineering.
Prerequisites and co-requisites:
Knowledge of solving differential equations.
Recommended optional programme components:
The course is part of a stream that aims at skills needed in the phenomenon-based modelling and planning of industrial processes.
Recommended or required reading:
Munson, B.R., Young, D.F. & Okiishi, T.H. Fundamentals of Fluid Mechanics.
Assessment methods and criteria:
This course utilizes continuous assessment. During the course there are 5 intermediate exams. The course can also be completed by final examination. Read more about the course assessment and grading systems of the University of Oulu at www.oulu.fi/english/studying/assessment.
Grading:
The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
University teacher Kaisu Ainassaari
Working life cooperation:
No

485308S: Foundation Engineering, 5 op

Voimassaolo: 01.08.2020 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Civil Engineering field

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:
5 ECTS credits/135 hours of work
Language of instruction:
Finnish
Timing:
The course unit is held in the spring semester during period 3
Learning outcomes:

After completing the course students know most common piled foundation types, the principles of creating excavation plan, environmental observation plan and ground improvement. Students are able to design retaining wall and yard base and top layers and also calculate ground stability.
Contents:
The basis of geotechnical and structural design of foundations. Foundation types and foundation construction. Piles and piled foundations. Retaining walls. Ground improvement. Filling and compaction. Drainage. Frost protection.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures and exercises (28 h), self-study (107 h)
Target group:
Students in master's programmes of environmental engineering
Prerequisites and co-requisites:
Recommend courses: 485301A Basics of Geomechanics, 485302A Basics of Foundation Engineering, 485102A Introduction to structural design
Recommended or required reading:
Materials delivered in lectures
Assessment methods and criteria:
Exam and assignment(s)
Grading:
Rating scale 1-5. 0 means not passed
Person responsible:
Veikko Pekkala
Working life cooperation:
-

485302A: Foundation Engineering, 5 op

Voimassaolo: 01.08.2019 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Civil Engineering field

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay485302A	Foundation Engineering (OPEN UNI)	5.0 op
488129S	Foundation Engineering	5.0 op

ECTS Credits:
5 ECTS credits / 135 hours of work
Language of instruction:
Finnish
Timing:
The course unit is held in the autumn semester during period 2
Learning outcomes:
After completing the course, students know the basics of base construction plan, can identify geotechnical dimensioning limit states and use partial factor method. Student can describe different foundation methods, types and principles of typical foundation piles, excavation types, risks and principles of risk management, radon. Student knows the principles of foundation drainage and frost protection. Student knows ultimate bearing capacity formula for shallow foundation (Eurocode).
Contents:
The basis of geotechnical design of foundations. Most common foundation types. Ground improvement. Drainage. Filling and compression. Frost protection. Radon.
Mode of delivery:
Face-to-face teaching.
Learning activities and teaching methods:
Lectures and exercises (28 h), self-study (107 h)
Target group:
Students in bachelor's program of civil engineering

Prerequisites and co-requisites:
Student has at least to have basic information about different soils and their physical properties. She/He understands the current of water in the soil. Shee/He can name the soils and can calculate effective stresses. She /He understands the shear strengths of soils and significanse of frost in the soil (for example a course 485301A basics of Geotechnics).
Recommended or required reading:
Materials delivered in lectures
Assessment methods and criteria:
Exam and assignment(s)
Grading:
The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
Anne Tuomela
Working life cooperation:
No
Other information:
This course will replace course 488129S Foundation Engineering.

485304S: Fundamentals of Civil Engineering, 5 op

Voimassaolo: 01.08.2019 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Civil Engineering field

Arvostelu: 1 - 5, pass, fail

Opettajat: Anssi Rauhala

Opintokohteen kielet: Finnish

Leikkaavuudet:

488121S	Fundamentals of Civil Engineering	5.0 op

ECTS Credits:
5 ECTS credits / 135 hours of work
Language of instruction:
Finnish
Timing:
The course unit is held in the autumn semester, during period 1
Learning outcomes:
The student understand how geotechnical design is joined to a part of society’s decision-making processes. He or she can prepare an assessment of foundation properties and design reinforcement. He or she understands specialties of railway construction and vibration problems. He or she gets the knowledge of property and surface drainage methods, how to lower groundwater table and what kind of risks are included to earth slopes and how to reinforce those.
Contents:
Norms and instructions, basis of geotechnical design, earth and road structures, soil improvement, property and surface drainage, lowering of groundwater table, pipeline construction, specialties of railway construction and vibration problems, geotechnical monitoring and measurements, earthworks.
Learning activities and teaching methods:
Lectures (34 h) and design and calculation exercises (10 h) also self-study (91 h)
Target group:
Master studens in the Civil Engineering program
Prerequisites and co-requisites:
Basic knowledge of geotechnics and soil mechanics, and ability to use AutoCAD software.
Recommended or required reading:
Lecture handout and other materials delivered in lectures
Assessment methods and criteria:
Examination and homeworks
Grading:
The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
Anssi Rauhala

Working life cooperation:
The course includes guest lectures from various sectors of civil engineering.
Other information:
This course will replace course 488121S Fundamentals of Civil Engineering in Academic year 2020-21.

488212A: Fundamentals of catalysis, 5 op

Voimassaolo: 01.08.2019 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Esa-Matti Turpeinen

Opintokohteen kielet: Finnish

Leikkaavuudet:

488309A Biocatalysis 5.0 op

ECTS Credits:
5 ECTS /135 hours of work
Language of instruction:
Finnish
Timing:
Implementation in spring semester during 3rd period.
Learning outcomes:
After completing this course, a student learns fundamentals of homogenous catalysis, heterogeneous catalysis and biocatalysis. The student understands phenomena occurring in catalysis. The student knows the most important preparation and characterization methods. The student recognizes catalytic applications. The student will be able to define what biocatalysts are, is able to describe how they are produced and give examples how biocatalysts are applied. The student recognizes the effect of the structure and the reaction conditions to the function of enzymes, and can explain the basic principles of enzymatic reactions and enzyme kinetics.
Contents:
Thermodynamic and kinetic fundamentals of catalysis. Principles of heterogeneous catalysis. Preparation and characterization of catalysts. Catalytic materials. Deactivation of catalysts. Applications of heterogeneous catalysis.
Microbes and enzymes as biocatalysts, production of biocatalysts, and the use of them in industry. The structure and function of enzymes, enzymatic reactions and basics of enzyme kinetics.
Mode of delivery:
Blended teaching
Learning activities and teaching methods:
Lectures / self-study
Target group:
Bachelor students in process and environmental engineering.
Prerequisites and co-requisites:
Thermodynamic equilibria
Reactor analysis
Basic Principles in Chemistry
Recommended or required reading:
Luentomateriaali;
Atkins P. & De Paula J. Atkins's Physical Chemistry, Oxford University Press, 8th edition, 2006 (tai jokin muu painos).
Gates B.C. Catalytic Chemistry, John Wiley&Sons, Singapore, 1992.
Cornils B. & Herrmann; W.A. (Eds.), Applied Homogeneous Catalysis with Organometallic Compounds, VCH, Weinheim, 1996.
Madigan M.T., Martinko, J.M. & Parker J. Brock Biology of Micro-organisms. Prentice Hall, 13. tai uudempi painos. 978-0-321-73551-5
Illanes A. (ed.): Enzyme Biocatalysis - Principles and Applications. Springer. 978-90-481-7854-4
Aittomäki, E. ym.: Bioprosessitekniikka. WSOY 2002. 951-26995-6
Prins R., Wang A. & Li X: Introduction to heterogeneous Catalysis. World Scientific Publishing Ltd, 2016.
Assessment methods and criteria:

Lectures, intermediate exams (välikokeet) or final examination. Grade will be composed of intermediate exams (välikokeet) or final examination.

Grading:
The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Read more about assessment criteria at the University of Oulu webpage: https://www.oulu.fi/forstudents/assesment-criteria
Person responsible:
Jouni Pursiainen, Esa Turpeinen, Johanna Panula-Perälä ja Satu Pitkäaho.
Working life cooperation:
No
Other information:
Course replaces the course 488309A Biocatalysis, 5.0 ECTS.

780117P: General and Inorganic Chemistry A, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Field of Chemistry

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

780120P	Basic Principles in Chemistry	5.0 op
ay780117P	General and Inorganic Chemistry A (OPEN UNI)	5.0 op
780115P	General and Inorganic Chemistry II	6.0 op
780114P	General and Inorganic Chemistry I	6.0 op
780113P	Introduction to Chemistry	12.0 op
780102P	Introduction to Inorganic Chemistry	5.0 op
780109P	Basic Principles in Chemistry	4.0 op

ECTS Credits:
5 credits / 134 hours of work
Language of instruction:
Finnish
Timing:
1st autumn
Learning outcomes:
After this course, the student:
- can explain organic and inorganic chemistry fundamentals, basic concepts and terminology.
- understand basic concepts of chemistry as described in international general chemistry curriculum.
Contents:
Basic concepts of chemistry, chemical formula, chemical reaction, chemical equation, oxidation-reduction reactions, stoichiometry, gases, chemical equilibrium, acids and bases, additional aspects of acid-base equilibria, solubility and complex-ion equilibria.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
30 hours of lectures and applications, 20 hours of exercises and 85 hours of self-study.
Target group:
Biochemistry, Chemistry compulsory. In the entity of 25 credits (minor studies), compulsory.
Physical sciences, Mathematical sciences, optional.
Prerequisites and co-requisites:
Upper secondary school chemistry.
Recommended optional programme components:
-
Recommended or required reading:

Petrucci, R.H., Herring, F.G., Madura, J.D. ja Bissonnette, C.: General Chemistry: Principles and Modern Applications, 11. edition (also 7., 8., 9. ja 10. edition), Pearson Canada Inc., Toronto, 2017. Chapters 1-6, 14.2, 15-18.

Assessment methods and criteria:
Completion of course assignments during the course.

Grading:
The course utilizes a numerical grading scale 0-5. In the numerical scale zero stands for a fail.

Person responsible:
Johanna Havia

Working life cooperation:
No

Other information:
No

780118P: General and Inorganic Chemistry B, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Field of Chemistry

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay780118P	General and Inorganic Chemistry B (OPEN UNI)	5.0 op
780114P	General and Inorganic Chemistry I	6.0 op
780115P	General and Inorganic Chemistry II	6.0 op
780113P	Introduction to Chemistry	12.0 op
780101P	Introduction to Physical Chemistry	7.0 op
780102P	Introduction to Inorganic Chemistry	5.0 op

ECTS Credits:
5 ECTS credits / 134 hours of work

Language of instruction:
Finnish

Timing:
1st autumn

Learning outcomes:
After this course, the student:
- can explain inorganic chemistry fundamentals, basic concepts and terminology
- understand basic concepts of chemistry as described in international general chemistry curriculum.

Contents:
Thermodynamics, reaction kinetics, electrochemistry, electrons in atoms, periodic table, chemical bond, intermolecular forces.

Mode of delivery:
Face-to-face teaching

Learning activities and teaching methods:
32 hours of lectures and applications, 18 hours of exercises, 85 hours of self-study.

Target group:
Biochemistry, Chemistry, compulsory. In the entity of 25 credits (minor studies), compulsory.
Physical sciences, Mathematical sciences, optional.

Prerequisites and co-requisites:
Upper secondary school chemistry.

Recommended optional programme components:
-

Recommended or required reading:
Petrucci, R.H., Herring, F.G., Madura, J.D. ja Bissonnette, C.: General Chemistry: Principles and Modern Applications, 11. edition (also 7., 8., 9. ja 10. edition), Pearson Canada Inc., Toronto, 2017. Chapters 7-11.1-11.7, 12.1, 13, 19-20.

Assessment methods and criteria:

Completion of course assignments during the course.
Grading:
The course utilizes a numerical grading scale 0-5. In the numerical scale zero stands for a fail.
Person responsible:
Matti Niemelä
Working life cooperation:
No

485306S: Geoenvironmental Engineering, 5 op

Voimassaolo: 01.08.2019 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Civil Engineering field

Arvostelu: 1 - 5, pass, fail

Opettajat: Tuomela, Anne Marika

Opintokohteen kielet: Finnish

Leikkaavuudet:

488131S Geoenvironmental Engineering 5.0 op

ECTS Credits:
5 ECTS credits / 135 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 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 knows how to use by-products from industry in different soil construction applications.
Contents:
Norms and instructions, a project work where student will discover a contaminated soil and make a proposal for remediation technique, properties of soil materials and industrial by-products, basis of geotechnical design for landfill environment, structures of dams and impoundments, geoenvironmental challenges in mining, remote sensing as a tool for geoenvironmental 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 Civil Engineering program
Prerequisites and co-requisites:
Student must have good basic information about the soil mechanics. She or the uderstand the behaviour of the soil as a medium. She/he knows the basics of soils properties, the current of water int he soil, have basic chemical konowledge of harmful substances and understanding about the foundation engineering.
Recommended optional programme components:
-
Recommended or required reading:
Lecture handout and other materials delivered in lectures
Assessment methods and criteria:
Written exam 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 Anne Tuomela
Working life cooperation:
The course includes a visit to a site decided later and also guest lectures from professionals in industry and administration.

Other information:
This course will replace course 488131S Geoenvironmental Engineering, 5 ECTS

477417S: High temperature chemistry, 5 op

Voimassaolo: 28.11.2016 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Eetu-Pekka Heikkinen

Opintokohteen kielet: Finnish

ECTS Credits:
5 cr / 135 hours of work.
Language of instruction:
Finnish
Timing:
The course is held in the autumn semester, during period II. It is recommended to complete the course at the 4th autumn semester.
Learning outcomes:
Students passing the course are familiar with the most important computational methods used to investigate the most essential phenomena in the research and development of high temperature processes. Students can e.g. calculate thermodynamic equilibria, read and construct phase stability diagrams as well as estimate slag properties and the effect of surface and interfacial phenomena on high temperature processes, etc.
Contents:
Models and methods that are used to investigate the chemical reactions in the research and development of high temperature processes. Contents are divided into five categories: 1. Compound and phase stabilities. 2. Thermodynamic modelling of pyrometallurgical solutions. 3. Slag properties. 4. Burning. 5. Interfacial phenomena.

Mode of delivery:
Classroom education and remote education
Learning activities and teaching methods:
Lectures (40 hours) supporting the exercises that are made during the course. Only in Finnish.

Target group:
Students of process metallurgy.
Prerequisites and co-requisites:
Knowledge and skills corresponding the knowledge and skills that are obtained from the Bachelor-level-studies in the programme of process or environmental engineering are recommended as prerequisities. In order to get credits from this course, bachelor thesis must be completed.
Students taking this course should know how to calculate thermodynamic equilibria for simple/ideal systems and they should be familiar with the concepts of entalphy, heat capacity, entropy, Gibbs free energy and phase equilibrium.
Recommended optional programme components:
This course is one of the courses of pyrometallurgy in the module of process metallurgy.

Recommended or required reading:
Material will be distributed during lectures and exercises. It is also available via courses Moodle-site. Each student is required to search additional material for the exercises when necessary.
Assessment methods and criteria:
Continuous assessment consisting of exercises that are made during the course. Please note that the course is organised only in Finnish.
Grading:
The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
University lecturer Eetu-Pekka Heikkinen
Working life cooperation:
There is no direct working life cooperation in this course.

Other information:

Due to continuous assessment used in this course, it is highly recommended that the students are present already in the first lecture.

477416S: High temperature processes, 5 op

Voimassaolo: 28.11.2016 - 31.07.2022

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Eetu-Pekka Heikkinen

Opintokohteen kielet: Finnish

Leikkaavuudet:

477427A	High temperature processes	5.0 op
ay477416S	High temperature processes (OPEN UNI)	5.0 op

ECTS Credits:
5 cr / 135 hours of work.
Language of instruction:
Finnish
Timing:
The course is held in the autumn semester, during period I. It is recommended to complete the course at the 4th autumn semester.
Learning outcomes:
SStudents passing the course are familiar with the metal production processes and metallurgical unit operations. Additionally, students know how to evaluate high temperature processes from different perspectives (energy and reductants, refractory materials, slags and ashes, waste and emissions as well as automation, measurements and modelling).
Contents:
The most important pyrometallurgical unit operations and other high temperature processes as well as things that need to be taken into account when considering high temperature processes (e.g. energy and reductants, refractory materials, slags and ashes, waste and emissions as well as automation, measurements and modelling).
Mode of delivery:
Classroom and remote education
Learning activities and teaching methods:
Lectures (approximately 45 hours) supporting the exercises that are made during the course. Only in Finnish.

Target group:
Students of process metallurgy.
Prerequisites and co-requisites:
Knowledge and skills corresponding the knowledge and skills that are obtained from the Bachelor-level-studies in the programme of process or environmental engineering are recommended as prerequisities. In order to get credits from this course, bachelor thesis must be completed.

Recommended optional programme components:
This course is one of the courses of pyrometallurgy in the module of process metallurgy.

Recommended or required reading:
Material will be distributed during lectures and exercises. It is also available via courses Moodle-site. Each student is required to search additional material for the exercises when necessary.
Assessment methods and criteria:
Continuous assessment consisting of exercises that are made during the course. Please note that the course is organised only in Finnish.
Grading:
The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
University lecturer Eetu-Pekka Heikkinen
Working life cooperation:
The course includes a seminar organized together with industry.
Other information:

Although it is not required to participate on lectures, it is highly recommended that the students are active and do the required exercises from the very beginning of the course due to continuous assessment used in this course.

451535P: History of Architecture I, lecture course, 4 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Oulu School of Architecture

Arvostelu: 1 - 5, pass, fail

Opettajat: Petri Vuojala

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay451535P History of Architecture I, lecture course (OPEN UNI) 4.0 op

ECTS Credits:
4 ECTS
Language of instruction:
Finnish
Timing:
Autumn term I and 2
Learning outcomes:
After completing the course the student can evaluate the interaction between style periods of European architectural history, technical development and social changes. The student can classify the different eras and recognize their most significant buildings and architects. After the course the student can interpret the classical language of architecture the classical grammar of architecture, as well as recognize the historical layers of built environment.
Contents:
Lectures discuss the general history of architecture and discipline of styles from prehistory until the end of 18th century and introduce old building methods like brickwork bonds and traditional vault constructions.
Mode of delivery:
Lectures, additionally independent studies
Learning activities and teaching methods:
Lessons 40 hrs
Target group:
1st year Bachelor level students
Prerequisites and co-requisites:
-
Recommended optional programme components:
Course is combined to exercises (451536P)
Recommended or required reading:
Handouts, digital slides. A literature list will be delivered during the course.
Assessment methods and criteria:
Assessment is based on attendance, learning diary or written examination.
Grading:
1-5. Learning diary or written examination.
Person responsible:
Professor (tenure) Anu Soikkeli
Working life cooperation:
-
Other information:
-

451537A: History of Architecture II, lecture course, 3 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Oulu School of Architecture

Arvostelu: 1 - 5, pass, fail

Opettajat: Petri Vuojala

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay451537A History of Architecture II, lecture course (OPEN UNI) 3.0 op

ECTS Credits:
3
Language of instruction:
Finnish (literature partly in English)
Timing:
Spring term I and 2
Learning outcomes:
During the course the student learns to recognize the historical roots of the contemporary architecture and recount the development up to today. Having completed the course, the student recognizes the most essential phenomena and styles of 19th and 20th century architecture and can reflect own personal views on contemporary architecture.
Contents:
Course discusses the general history of architecture of 19th and 20th centuries.
Mode of delivery:
Lectures, additionally independent studies.
Learning activities and teaching methods:
Lectures 21 hrs, seminars 15 hrs
Target group:
1st year Bachelor’s level students
Prerequisites and co-requisites:
History of architecture I, lecture course (451535P)
Recommended optional programme components:
Course is combined to practices (451538A)
Recommended or required reading:
Handouts, digital slides. A literature list will be handed out during the course
Assessment methods and criteria:
Assessment is based on attendance, learning diary or written examination
Grading:
1-5
Person responsible:
Professor (tenure) Anu Soikkeli
Working life cooperation:
-
Other information:
-

451504A: History of Architecture III, 3 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Oulu School of Architecture

Arvostelu: 1 - 5, pass, fail

Opettajat: Petri Vuojala

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay451504A History of Architecture III (OPEN UNI) 3.0 op

ECTS Credits:
3
Language of instruction:

Finnish (literature in English and Swedish)
Timing:
Autumn term 2 and spring term I
Learning outcomes:
The aim is to provide basic knowledge on the history of the Scandinavian and Finnish architecture from the prehistory until the 20th century.
After completing the course the student masters the historical background of the architecture of Finland and Scandinavia starting from pre-historical times. The student recognizes the temporal and stylistic layers of the history of our building tradition and is able to explicate features of Finland's architectural evolvement in a relation with the international development and especially in correlation to Sweden and the other Nordic countries.
Contents:
Lecture discusses the history of architecture in Scandinavia and especially in Finland from prehistory till 20th C.
Mode of delivery:
Lectures, additionally independent studies.
Learning activities and teaching methods:
Lectures 36 h
Target group:
3rd year Bachelor level students.
Prerequisites and co-requisites:
History of architecture I and II, lecture courses (451535P and 451537A)
Recommended optional programme components:
The course is related to the History of Architecture III, practices course (451505A). Together with the Architecture III, practices course, this course can form the Bachelor's diploma work (8 ECTS) of the Bachelor's degree.
Recommended or required reading:
Handouts, digital slides. A literature list will be handed out during the course.
Assessment methods and criteria:
Assessment is based learning diary or written examination.
Grading:
1-5
Person responsible:
Professor (tenure) Anu Soikkeli
Working life cooperation:
-
Other information:
-

488102A: Hydrological Processes, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay488102A	Hydrological Processes (OPEN UNI)	5.0 op
480207A	Hydraulics and Hydrology	5.0 op

ECTS Credits:
5 ECTS credits / 133 hours of work

Language of instruction:
Finnish, but also option to complete the course in English.
Timing:
The course is held in the autumn semester during the period 1. It is recommended to complete the course at the 1st autumn semester of the international master program of environmental engineering.

Learning outcomes:

After the course, the student understands and can describe the main hydrological processes, water movements and hydraulics phenomenon quantitatively through mathematical methods. The student also understands and quantifies the relation between state and flow with rela-tion to snowmelt, evaporation, infiltration and groundwater flow.

Contents:
Hydrological cycle, physical properties of water, distribution of water resources, water balance, precipitation, evapotranspiration, soil and ground water, infiltration, runoff, snow hydrology, hydrometry, water quality of rivers and lakes.

Mode of delivery:
Face-to-face education and blended learning.

Learning activities and teaching methods:
The course contain lectures (24 h), guided exercise sessions (16 h) and small assignments during the course. There is also exam in the course.
Independent work load is about 93 h. Totally 133 h.

Target group:
Students in international master programs of Environmental 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: 477221A Material and Energy Balances (previously 477201A Material and Energy Balances) and 477052A Fluid mechanics.

Recommended optional programme components:
The course is a prerequisite for most of master level studies.

Recommended or required reading:
Physical Hydrology (Dingman SL, 2002, 2nd Edition, ISBN 978-1-57766-561-8), Fluid Mechanics and Hydraulics (Giles, Evett and Liu, 3rd Edition, ISBN 0-07-020509-4)

Assessment methods and criteria:
The assignments must be returned and passed with threshold of 50% in order to get final examination. The final grade of the course is weighted average of assignment reports (80%) and examination (20%).

Grading:
The assignments must be returned and passed with threshold of 50% in order to get final examination. The final grade of the course is weighted average of assignment reports (80%) and examination (20%).

Person responsible:
Assistant Professor Hannu Marttila

Working life cooperation:
Examples solved in the lectures based on real problems.

Other information:
The English version of the course is organized parelle to Finnish version of the course.

450547A: Indesign Basics, 1 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Oulu School of Architecture

Arvostelu: 1 - 5, pass, fail

Opettajat: Asko Leinonen

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay450547A Indesign Basics (OPEN UNI) 1.0 op

ECTS Credits:
1

Language of instruction:
Finnish

Timing:
-

Learning outcomes:
Students master the basic page layout features and understand the possibilities of the software. Students are able to produce pages ready for release combining visual and textual material from various sources.
Contents:
Placing formatted text and pictures, page layout and PDF publishing.
Mode of delivery:
Lectures and course work.
Learning activities and teaching methods:
-
Target group:
The bachelor students of Oulu School of Architecture
Prerequisites and co-requisites:
-
Recommended optional programme components:
-
Recommended or required reading:
Software help files and handouts.
Assessment methods and criteria:
Based on a project work (the presentation material of a design course at the Department of Architecture or an equivalent work).
Grading:
Pass / fail
Person responsible:
n.n.
Working life cooperation:
Students will learn to use the basic skills of Adobe InDesign publishing software and apply those skills in practical work. Students can use style settings in InDesign to make well controlled text and graphic layouts in hands-on work.
Other information:
Basic features of page layout in Indesign. The course is intended for the students of Oulu school of Architecture only.

ayA440190: Industrial Engineering and Management (IEM) Minor Subject Studies (OPEN UNI), 25 op

Voimassaolo: 01.01.2014 -

Opiskelumuoto: Intermediate Studies

Laji: Study module

Vastuuyksikkö: University of Oulu, Open University

Arvostelu: 1 - 5, pass, fail

Opetus suunnattu: University of Oulu, Open University

Opintokohteen kielet: Finnish

Leikkaavuudet:

A440190 Industrial Engineering and Management (IEM) Minor Subject Studies 25.0 op

Compulsory

ay555225P: Basics of industrial engineering and management (OPEN UNI), 5 op

Voimassaolo: 01.01.2014 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: University of Oulu, Open University

Arvostelu: 1 - 5, pass, fail

Opetus suunnattu: University of Oulu, Open University

Opettajat: Erno Mustonen

Opintokohteen kielet: Finnish

Leikkaavuudet:

555225P Basics of industrial engineering and management 5.0 op

ay555285A: Project management (OPEN UNI), 5 op

Voimassaolo: 01.01.2014 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: University of Oulu, Open University
Arvostelu: 1 - 5, pass, fail
Opetus suunnattu: University of Oulu, Open University
Opettajat: Kirsi Aaltonen
Opintokohteen kielet: Finnish
Leikkaavuudet:

555288A Project Management 5.0 op
555285A Project management 5.0 op

ay555268P: Basic course in well-being and safety at work (OPEN UNI), 5 op

Voimassaolo: 01.08.2021 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: University of Oulu, Open University
Arvostelu: 1 - 5, pass, fail
Opetus suunnattu: University of Oulu, Open University
Opettajat: Henri Jounila
Opintokohteen kielet: Finnish

ay555286A: Process and quality management (OPEN UNI), 5 op

Voimassaolo: 01.01.2014 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: University of Oulu, Open University
Arvostelu: 1 - 5, pass, fail
Opetus suunnattu: University of Oulu, Open University
Opettajat: Osmo Kauppila
Opintokohteen kielet: Finnish
Leikkaavuudet:

555286A Process and quality management 5.0 op

ay555242A: Product development (OPEN UNI), 5 op

Voimassaolo: 01.01.2014 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: University of Oulu, Open University
Arvostelu: 1 - 5, pass, fail
Opetus suunnattu: University of Oulu, Open University

Opettajat: Kai Hänninen
Opintokohteen kielet: Finnish
Leikkaavuudet:

555242A Product development 5.0 op

488215S: Industry and Environment, 5 op

Voimassaolo: 28.06.2019 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Process and Environmental Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Väisänen, Virpi Maria
Opintokohteen kielet: English
Leikkaavuudet:

477334S Industrial activities and environment 5.0 op
ay488215S Industry and Environment (OPEN UNI) 5.0 op
488221S Environmental Load of Industry 5.0 op
488205S Environmental Load of Process Industry 4.0 op

ECTS Credits:
5 cr / 135 hours of work
Language of instruction:
English
Timing:
Period 2
Learning outcomes:
The student is able to identify the essential features of the environmental load in different types of (chemical, wood, metallurgical,...) industry. He/she is able to explain the type, quality, quantity and sources of the emissions. The student is familiarized with the main emission control systems and techniques in different industrial sectors. The student can explain the environmental management system of an industrial plant and is able to apply it to an industrial plant.
Contents:
Effluents: types, quality, quantity, sources. Unit operations in managing effluents, comprehensive effluent treatment. Environmental management systems, environmental licences, environmental reporting and BAT.
Mode of delivery:
Face-to-face teaching.
Learning activities and teaching methods:
Lectures 40 h, self-study 93h.
Target group:
Master's degree students of the Process and Environmental Engineering study programmes.
Prerequisites and co-requisites:
The courses 477011P Introduction to Process and Environmental Engineering I, 488011P Introduction to Process and Environmental Engineering II, 488204S Air Pollution Control Engineering and 488110S Water and Wastewater Treatment recommended beforehand.
Recommended or required reading:
Material represented in lectures and in the Optima environment.
Assessment methods and criteria:
Written final exam or a learning diary.
Read more about the course assessment and grading systems of the University of Oulu at https://www.oulu.fi/forstudents/assesment-criteria

Grading:
The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail
Person responsible:
Virpi Väisänen
Working life cooperation:

No.
Other information:
The course mainly consists of specific lectures presented by experts who are invited from industry.

This course replaces course 488221S Environmental Load of Industry.

477129S: Inorganics Materials in Circular Economy, 5 op

Voimassaolo: 01.08.2019 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Process and Environmental Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Elisa Koivuranta
Opintokohteen kielet: English
Leikkaavuudet:

ay477129S Inorganics Materials in Circular Economy (OPEN UNI) 5.0 op

ECTS Credits:
5 cr
Language of instruction:
Finnish, English
Timing:
Spring, period 4
Learning outcomes:
Upon completion of the course, a student explains the main incentives, possibilities, challenges and barriers behind the utilization of high-volume industrial residues. Student is familiarized with environmental and legislative aspects related to utilization of industrial residues. The student can plan new business while taking the limitations set by the environmental and legislative aspects and the industrial residue into account.
Contents:
Properties, processing, and utilization potential of industrial residues in various applications. Specific focus in novel large-scale applications. An overview of regulatory aspects related to waste utilization. Environmental and safety aspects of materials. Product development in the context of industrial residues.
Prerequisites and co-requisites:
Not limited to certain degree programs.
Assessment methods and criteria:
Group work and final seminar.
Grading:
Pass/Fail
Person responsible:
Elisa Koivuranta
Working life cooperation:
Visiting lectures from the industry.

771113P: Introduction to Geology I, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Oulu Mining School
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

ay771113P Introduction to Geology I (OPEN UNI) 5.0 op

ECTS Credits:
5 credits

Language of instruction:
Finnish
Timing:
1st year autumn
Learning outcomes:
Stdents have an understanding of the basic concepts of the Earth, from its composition and internal *structure* to the geological *processes* that has led to its evolution the present Earth as part of the solar system. They can tell how endogenic processes in the mantle and crust produce magmas and how magmas produce different igneous rock type upon emplacement below and on the Earth's surface. Students are able to recognise and classify common igneous rocks based on their mineral composition and are familiar with common metamorphic rocks and know the metamorphic facies concepts. They can relate deformation and metamorphism of the rocks to plate tectonic processes.

Contents:
Evolution of the Earth as part of the solar system, structure and composition of the Earth. Classification of igneous rocks, magmatism, origin and crystallisation of magmas, volcanism, metamorphism and formation of metamorphic rocks, plate tectonics and deformation structures.
Mode of delivery:
Face to face
Learning activities and teaching methods:
36 h lectures, 6 h exercises
Target group:
1st year geoscience students. The course is a good minor subject course for others.
Prerequisites and co-requisites:
Basic course in mineralogy (771102P) is parallel to this course.
Recommended optional programme components:
This course is intended as an introduction to the scope and methods of igneous and metamorphic petrology.
Recommended or required reading:
Martti Lehtinen, Pekka Nurminen and Tapani Rämö (1998) Suomen kallioperä – 3000 vuosimiljoonaa. Suomen Geologinen Seura, Gummerus Jyväskylä, ISBN 952-90-9260-1, Chapters 2-3. John Grotzinger & Thomas H. Jordan (2010 or 2014) Understanding Earth, 6 th or 7 th edition, Chapters 1-4, 6-7, 9-10, 12.
Assessment methods and criteria:
Written examination and identification test of rock types.
Grading:
5-1/fail
Person responsible:
Kari Strand
Working life cooperation:
No

771114P: Introduction to Geology II, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Juha Pekka Lunkka

Opintokohteen kielet: Finnish

ECTS Credits:
5 ECTS / 133 hours of work
Language of instruction:
Finnish
Timing:
1st year autumn
Learning outcomes:
Upon completion of the course, students should have acquired basic knowledge on the concepts and processes of surficial geology. Students should also be able to identify basic sediment types and soils.
Contents:

Basic concepts of surficial physical geology, weathering, erosion, sedimentation, and sediment types, soils and geological processes forming sedimentary deposits.
Mode of delivery:
Face to face teaching
Learning activities and teaching methods:
16 h lectures, 8 h exercises
Target group:
1st year Geoscience students. The course is a good minor subject course for others.
Prerequisites and co-requisites:
No
Recommended or required reading:
Handouts and John Grotzinger & Thomas H. Jordan (2010 or 2014) Understanding Earth, 6th or 7th edition, Chapters 5, 8, 15-21.
The availability of the literature can be checked from this link.
Assessment methods and criteria:
Obligatory exercises and written examination
Grading:
5-1/fail
Person responsible:
Juha Pekka Lunkka and Tiina Eskola
Working life cooperation:
No

780116P: Introduction to Organic Chemistry, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Field of Chemistry

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay780116P	Introduction to Organic Chemistry (OPEN UNI)	5.0 op
780103P2	Organic Chemistry I	6.0 op
780108P	Basic Course in Organic Chemistry	6.0 op
780112P	Introduction to Organic Chemistry	4.0 op
780103P	Introduction to Organic Chemistry	6.0 op

ECTS Credits:
5 ECTS credits / 134 hours of work
Language of instruction:
Finnish. Book-examination in English as well.
Timing:
1st spring
Learning outcomes:
After this course, the student:
- can recognize and name basic organic compunds and explain their properties.
- can explain organic chemistry basic consepts.
- can deduce basic recation types and solve their mechanisms.
Contents:
Classification of organic compounds and their properties. Basic reactions of organic compounds: addition, elimination and substitution along with the reaction mechanisms. Basics of stereochemistry.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
32 hours of lectures plus 16 hours of exercises, 84 hours of independent self-study.
Target group:
Biochemistry, Chemistry, Biology, Process Engineering, Environmental Engineering and in the study entity of 25 credits, compulsory.

Physical Sciences, Geology, Geograhpy, Mathematical Sciences, optional.
Prerequisites and co-requisites:
Upper secondary school chemistry
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:
Hart, H.: Organic Chemistry: A Short Course, 10. ed. or newer, Houhgton Mifflin, Boston, 1999; Hart, H. ja Hart, D.: Study Guide & Solutions Book, Organic Chemistry: A Short Course, 10. ed. or newer, Houghton Mifflin, Boston, 1999 and material in Moodle.
Assessment methods and criteria:
Completion of assessed course assignments during the course.
Grading:
The course utilizes a numerical grading scale 0-5. In the numerical scale zero stands for a fail.
Person responsible:
Johanna Kärkkäinen
Working life cooperation:
No

771116P: Introduction to Quaternary deposits of Finland and their resources, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Juha Pekka Lunkka

Opintokohteen kielet: Finnish

ECTS Credits:
5 ECTS / 133 hours of work
Language of instruction:
Finnish
Timing:
1st year spring
Learning outcomes:
Students can describe the main features and raw material resources of the Finnish Quaternary deposits.
Contents:
Main features and raw material resources of the Finnish Quaternary deposits and their origin.

Mode of delivery:
Face to face teaching
Learning activities and teaching methods:
22 h lectures. In addition, a one-day field trip is organized in May for major subject students.

Target group:
1st year Geoscience students. The course is a good minor subject course for others.
Prerequisites and co-requisites:
Introduction to Geology II (771114P) or equivalent knowledge

Recommended or required reading:
Veli-Pekka Salonen, Matti Eronen, Matti Saarnisto (2002) Käytännön maaperägeologia, 236 s.
The availability of the literature can be checked from this link.
Assessment methods and criteria:
Written examination

Grading:
5-1/fail
Person responsible:
Juha Pekka Lunkka
Working life cooperation:
No

771115P: Introduction to bedrock geology of Finland and ore geology, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Oulu Mining School
Arvostelu: 1 - 5, pass, fail
Opettajat: Kari Strand
Opintokohteen kielet: Finnish

ECTS Credits:
5 credits
Language of instruction:
Finnish
Timing:
1st year spring
Learning outcomes:
Students can describe and recognise the main geological unist of the Finnish bedrock and nane them based on their stratigraphic position and age relations. They can connect the major geological units to the main stages of the plate tectonic evolution. Students are familiar with most common ore types and industrial minerals occurring in the bedrock and the principal processes leading to their formation and how they are explored.
Contents:
Lithostratigraphical units, the Archaean and Palaeoproterozoic bedrock of Finland and younger rock formations. Mineral resources, their classification and origin, exploration methods.
Mode of delivery:
Face to face
Learning activities and teaching methods:
24 h lectures. In addition, a one-day field trip is organized in May for major subject students.
Target group:
Major and minor subject students starting studies in geology.
Prerequisites and co-requisites:
Basic course in mineralogy (771102P), Introduction to Geology I (771113P), Introduction to Geology II (771114P) or equivalent knowledge.
Recommended or required reading:
Material given during the lectures and Lehtinen, M., Nurmi, P., Rämö, T. (1998) Suomen kallioperä – 3000 vuosimiljoonaa. Suomen Geologinen Seura, Gummerus Jyväskylä, ISBN 952-90-9260-1, p. 94-324 (available on webpages of Suomen Geologisen Seura). Parts of Craig, J.R., Vaughan, D.J. & Skinner, B.J. (1996) Resources of the Earth - Origin, Use, and Environmental Impact. Prentice Hall, 472 p.
Assessment methods and criteria:
Written examination.
Grading:
5-1/fail
Person responsible:
Eero Hanski
Working life cooperation:
No

ay780173P: Introduction to green chemistry (OPEN UNI), 2 op

Voimassaolo: 01.08.2021 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: University of Oulu, Open University
Arvostelu: 1 - 5, pass, fail
Opetus suunnattu: University of Oulu, Open University
Opintokohteen kielet: Finnish

Leikkaavuudet:

780173P Introduction to green chemistry 2.0 op

ECTS Credits:
2
Language of instruction:
Finnish
Learning outcomes:
The students know the basic principles of green chemistry and can describe them using examples
Contents:
Basic principles the of green chemistry 12. Basics for catalytic, green solvents, and activation of reactions by ultrasound and microwaves. Introduction to risk and lifecycle assessment.
Mode of delivery:
Web-based teaching
Learning activities and teaching methods:
The online course is divided into weekly periods (7 weeks). The assignments and reflections of the teaching period can be done at your own pace during the week.
Target group:
Open university students
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:
Material in Moodle and additional information to be searched for yourself
Assessment methods and criteria:
Each section of the course has assignments that the student needs to complete
Grading:
The course utilizes verbal grading scale “Pass/ Fail”
Person responsible:
University Lecturer, Minna Tiainen

491101P: Introduction to mining, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Saija Luukkanen

Opintokohteen kielet: Finnish

ECTS Credits:
5 cr
Language of instruction:
Finnish. Materials possibly partly in English.
Timing:
Autumn term, period 1
Learning outcomes:
After completing the course student can explain the various stages of mine value chain from exploration until the final concentrate. A student understands economical, social and environmental aspects of sustainable mining.
Contents:
Different stages of mine development: exploration, environmental aspects, geochemical and geophysical measurements, basics in mining engineering and mineral processing.
Mode of delivery:
Face to face teaching
Learning activities and teaching methods:
Lectures, practicals, final exam
Target group:
Bachelor's students in mining engineering and mineral processing, geosciences and process engineering
Recommended or required reading:
Online materials presented during the lectures

Assessment methods and criteria:
Final exam, practicals, activity
Grading:
5-1/failed
Person responsible:
Prof. Saija Luukkanen

491102P: Introduction to solid earth geophysics, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Moisio, Kari Juhani

Opintokohteen kielet: Finnish

Timing:
Spring semester, period 3. Recommended at 1st or 2nd year of the Bachelor studies.
Learning outcomes:
Upon the completion of the course, a student can describe the position and role of geophysics in the field of the Earth system sciences, can describe the structure of the Earth and its neighbouring environment in space (spheres), their internalgeophysical properties and the interactions between different spheres, can describe large scale transfer (movement) of rock material inside the Earth and on its surface (convention, plate tections) and can name most common geophysical research methods.
Contents:
An overview of geophysics. Solid Earth geo-physics and Earth Sciences. Properties, structure and dynamics of the Earth. Earth as a planet: shape, size, rotation, revolution. Earth´s gravitational field. Isostasy. Deformation and rheology. Seismology: seismic waves and the internal structure of the Earth. Earth´s geomagnetic field. Geothermics. Electric and electromagnetic methods.
Learning activities and teaching methods:
A specific target group is written in this field.
Prerequisites and co-requisites:
No specific prerequisites.
Recommended or required reading:
Lecture materials. U. Borén, E. Hjelt, S.-E., Karjalainen, T. ja Sirviö, J., 20014. Geofysiikka, Tunne maapallosi. WSOY, 191 p. Additional recommended reading: Musset, A.E. and Aftab Khan, M., 2000: Looking into the Earth: an introduction to geological geophysics. Cambridge University Press, 470 pp. ja Lowrie, W., 1997. Fundamentals of geophysics. Cambridge University press, 354 p.
Assessment methods and criteria:
Variable grading and evaluation methods
Grading:
1-5/fall
Person responsible:
Kari Moisio
Working life cooperation:
No working life cooperation

485102A: Introduction to structural design, 5 op

Voimassaolo: 01.08.2019 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Civil Engineering field

Arvostelu: 1 - 5, pass, fail

Opettajat: Liedes, Hannu Tapani

Opintokohteen kielet: Finnish

Leikkaavuudet:

466102A Introduction to structural design 3.0 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
Other information:
This course will replace course 466102A Rakennesuunnittelun perusteet in Academic year 2020-21.

555382S: Management of a project-based firm, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jaakko Kujala

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
5 ECTS cr
Language of instruction:
English.
Timing:
Period 3.
Learning outcomes:
Upon completion of the course student will be able to:

- describe the core areas of the management of the project-based firm

- explain how different internal and external contextual factors affect the business of a project-based firm, and how they should be taken account in the design of a business model
- understand the role of services in the business of a project-based firm
- apply systematic approach to project negotiation
- evaluate the significance of a single project for the business of a project based-firm

Contents:
Contextual factors in project business, business model of a project-based firm, integration of services to the business of a project-based firm, project sales and marketing, contracting, project negotiations (negotiation analytic approach) and organising support functions in project-based firm.
Mode of delivery:
The tuition will be implemented as blended teaching.
Learning activities and teaching methods:
Lectures 24h / self-study56h / group exercise 54h
Target group:
Industrial Engineering and Management students.
Prerequisites and co-requisites:
B.Sc. in Industrial Engineering and Management or equivalent.
Recommended optional programme components:
-
Recommended or required reading:
Lecture materials. Other materials will be defined at the beginning of the course.
Assessment methods and criteria:
The course utilises continuous assessment. During the course, the students must write a learning diary for each lecture and participate actively in the lectures. 40% of the grade is based on the group work.
Grading:
The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
Professor Jaakko Kujala
Working life cooperation:
Group work will be done for a project-based firm or public sector organisation.
Other information:
Previous course name Project Business

477323A: Mass and Heat Transfer, 5 op

Voimassaolo: 01.08.2019 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Ainassaari, Kaisu Maritta

Opintokohteen kielet: Finnish

Leikkaavuudet:

477322A	Heat and Mass Transfer	5.0 op

ECTS Credits:
5 ECTS / 133 hours of work
Language of instruction:
Finnish, can be completed in English as a book examination.
Timing:
Implementation in autumn semester during 1st and 2nd periods. It is recommended to complete the course at the third (Bachelor's) autumn semester.
Learning outcomes:
After passing the course the student knows what happens when heat is transferred by conduction, convection and radiation. The student can describe energy transfer with differential energy balances. In macro scale the student is able to solve practical heat transfer problems by correlating heat transfer coefficients to dimensionless flow and material characteristics. With the help of these transfer coefficients the student is capable of estimating the size of heat transfer equipment, especially heat exchangers and select the most suitable and profitable types, and to sketch large heat nets and to diminish the costs of the equipments.

The student is able to use the pinch method which optimises the number of heat exchangers and total energy consumption. He/she is also able to apply the exergy principle to make work from thermal energy. With the aid of this principle he/she will be able to divide the costs of the used energy in right proportion based on the processing stage. He/she student is able to explain diffusion as a phenomenon and the factors affecting it. He/she is able to model mass transfer in simple systems by using the theory of Fick. The student is capable of modeling diffusion by differential mass balances. He/she recognises the special features of mass transfer in turbulent systems and the role of different transport phenomena in mass transfer equipment. He/she has rudimentary practical skills applicable to the scale-up of the equipment used for absorption.

Contents:
Mechanism of heat transfer. Creating and solving differential energy balances. Heat transfer coefficient. Macroscopic balances. Selection of a proper type of heat exchanger.Scale-up and design of a heat exchanger. Design of heat exchanger networks using pinch technology.Exergy analysis for the heat flows. Diffusion. The Fick law of diffusion. Mass transfer in simple systems. Differential mass balances. Models of mass transfer in turbulent systems. Interphase mass transfer. Absorption.

Mode of delivery:
Face-to-face teaching in Finnish. Book examination possible in English.

Learning activities and teaching methods:
Lectures 45 h, homework 15 h and self-study 73 h. For foreign students written examination based on given literature.

Target group:
Bachelor's degree students of process and environmental engineering.

Prerequisites and co-requisites:
Knowledge of solving differential equations.

Recommended optional programme components:
The course is part of a stream that aims at skills needed in the phenomenon-based modelling and planning of industrial processes.

Recommended or required reading:
Welty J.R., Rorrer G.L. & Foster D.G. Fundamentals of Momentum, Heat and Mass Transfer, International student version, 6. ed, Wiley 2015,ISBN 978-1-118-80887-0, parts 14-28.

Assessment methods and criteria:
This course utilizes continuous assessment. During the course there are 4 intermediate exams in Finnish. The course can also be completed by final examination.

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

Person responsible:
University teacher Kaisu Ainassaari

Working life cooperation:
No

Other information:
Replaces the course 477322A Lämmön ja aineensiirto, 5 ects.

ay477231A: Material and Energy Balances I (OPEN UNI), 2 op

Voimassaolo: 01.01.2020 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: University of Oulu, Open University

Arvostelu: 1 - 5, pass, fail

Opetus suunnattu: University of Oulu, Open University

Opintokohteen kielet: Finnish

Leikkaavuudet:

477231A	Material and Energy Balances I	2.0 op
ay477221A	Material and Energy Balances (OPEN UNI)	5.0 op
477221A	Material and Energy Balances	5.0 op

ay477232A: Material and Energy Balances II (OPEN UNI), 3 op

Voimassaolo: 01.01.2020 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: University of Oulu, Open University
Arvostelu: 1 - 5, pass, fail
Opetus suunnattu: University of Oulu, Open University
Opettajat: Ahola, Juha Lennart
Opintokohteen kielet: Finnish
Leikkaavuudet:

477232A Material and Energy Balances II 3.0 op
477221A Material and Energy Balances 5.0 op
ay477221A Material and Energy Balances (OPEN UNI) 5.0 op

477124S: Mechanical processing of biomasses, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Process and Environmental Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Elisa Koivuranta
Opintokohteen kielet: English
Leikkaavuudet:

477105S Mechanical Processing of Biomasses 3.0 op

ECTS Credits:
5 ECTS / 133 h of work
Language of instruction:
English
Timing:
Implementation in autumn period 2.
Learning outcomes:
Upon completion of the course, a student should be able to explain the value chain of mechanical and chemimechmical processing of renewable lignocellulosic raw materials. Upon completion of the course, a student should be able to identify the unit operations of mechanical and chemi-mechanical pulping process and can explain their operational principles. The student can evaluate the raw material properties and importance of different unit processes on the quality of the end products. In addition, the student can compare fibre properties of different mechanical and chemi-mechanical pulps and wood powders and can explain their effects on the quality of the end product. Student can explain production principle of engineered wood, biocomposites and pelletizing.
Contents:
Processing of wood, mechanical fibres, wood powders: raw material properties, mechanical and chemimechanical defibering, screening, bleaching, biomass micronization and pulverization, the production of engineered wood, wood-plastic composites and pellets. End product properties.
Mode of delivery:
Blended teaching
Learning activities and teaching methods:
The implementation methods of the course vary. Lectures and exercises max. 34 h, web learning and self-study 99 h. A part of the teaching can be replaced by group work or home work.
Target group:
Students interested in bioeconomy.
Prerequisites and co-requisites:
488052A Introduction to Bioproduct and Bioprocess Engineering is recommended (course has changed to course 488054S 2021-22).
Recommended or required reading:

Book series: Fapet Oy. Papermaking Science and Technology, book 5: Mechanical Pulping. Lecture materials and other materials that will be announced at the lectures.
Assessment methods and criteria:
This course utilizes continuous assessment including intermediate exam(s) with potential web learning and homework. Read more about the course assessment and grading systems of the University of Oulu at https://www.oulu.fi/forstudents/assesment-criteria
Grading:
The course utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
Elisa Koivuranta
Working life cooperation:
Visiting lecturers from the industry and/or a visit/excursion to a local manufacturing site, when feasible.

461108A: Mechanics of materials, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Koivurova Hannu

Opintokohteen kielet: Finnish

ECTS Credits:
5 ECTS credits / 135 hours
Language of instruction:
Finnish
Timing:
The course is held in the Autumn semester, during periods 1 and 2. It is recommended to complete the course at the 3rd Autumn semester.
Learning outcomes:
Upon completing the required coursework, the student knows the theoretical background of the strength of materials and he/she is able to apply the theory of the strength of materials to different kind of design problems needed in engineering mechanics. He/she understand the fundamental concepts of mechanics of deformable solids; including static equilibrium, geometry of deformation, and material constitutive behavior. He/she can discuss the basic mechanical principles underlying modern approaches for modelling of various types of materials under a different type of loadings. This provide students with exposure to the systematic methods for solving engineering problems in solid mechanics. He/she can also build the necessary theoretical background for further structural analysis and design courses.
Contents:
The general equations of mechanics. The stress and strain state. Different material models; Linear elastic material, isotropic, transverse-isotropic and orthotropic material models. The concept of strain energy. Theory of plasticity. Yield criterion, plastic flow rule and hardening. Limit state design. Introduction to visco elastic material and creep teory.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 28 h / Exercise 28 h / Self-study 79 h.
Target group:
Students of the Bachelor Stage of the Mechanical Engineering Degree Programme.
Prerequisites and co-requisites:
Recommended: Strength of Materials I and II and the knowledge of vector and matrix calculations.
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., Virtanen, S. (2008) Materiaalien Mekaniikka. Pressus Oy.
Assessment methods and criteria:

This course utilizes continuous assessment. During the course, there are 2 intermediate exams. In addition to this, the students will be asked to calculate homeworks, and theses homeworks will be assessed. The assessment of the course is based on the learning outcomes of the course. The more detailed assessment criteria are available on the Moodle Study Portal.

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

Person responsible:
University Lecturer Hannu Koivurova

ay452561S: Modern Wood Architecture (OPEN UNI), 7 op

Voimassaolo: 01.08.2021 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: University of Oulu, Open University

Arvostelu: 1 - 5, pass, fail

Opetus suunnattu: University of Oulu, Open University

Opintokohteen kielet: Finnish

Leikkaavuudet:

452561S Modern Wood Architecture 15.0 op

ECTS Credits:
15 ECTS

Language of instruction:
Finnish

Timing:
Autumn term I and II

Learning outcomes:
After accomplishing the course, a student will comprehend the characteristics of mass timber construction in terms of architectural design process from early sketches to realization. The central collaboration in actual building projects between architects and structural engineers is introduced to students during the course, which includes shared segments with the Structures and Construction Technology Research Unit.
In terms of structural materials, focus is on logs, LVL and CLT. Additionally, other mass timber products, such as glued laminated timber and different non-glued solutions are addressed. The fundamental topics related to nature and quality of mass timber architecture are in the core of the course.
In the scope of mass timber and architectural design, the students are expected to get acquainted with i.a. common structural systems, the spans and dimensions of structures as well as the principals of stiffening the structural frame of a building. Students are expected to acknowledge also other technical limitations related to mass timber set by factors like fire, acoustics, and moisture. Additionally, the role of visible joinery in architecture is to be taken into consideration. The limitations related to pre-fabrication, such as maximum dimensions and weight of elements need to be recognized in terms of fabrication, transportation and building.

Contents:
Building products and systems of mass timber in terms of architectural design. The process of architectural design from early sketches to realization. The characteristics of mass timber architecture. Collaboration between architects and structural engineers.

Mode of delivery:
Online.

Recommended or required reading:
Online lectures and other materials shared during the course.

Assessment methods and criteria:
The course contains four exercises, including a learning portfolio and design exercise, which are presented in public webinars. In addition, students participate in online discussions and oppose portfolios of peer students. Accomplishment of the course requires completing the exercises. The grade is based on the design exercise and the learning portfolio. Evaluation criteria are explained more closely in the course assignment.

Grading:
1-5

Person responsible:
Professors Anssi Lassila, Matti Sanaksenaho, Janne Pihlajaniemi, teacher/researcher Matti Lakkala

485121S: Numerical methods in structural engineering, 5 op

Voimassaolo: 01.08.2021 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Civil Engineering field

Arvostelu: 1 - 5, pass, fail

Opettajat: Antti Niemi

Opintokohteen kielet: Finnish

Leikkaavuudet:

485109A Numerical methods in structural engineering 5.0 op

ECTS Credits:
5 ETCS / 135 hours of work
Language of instruction:
Lectures in Finnish. Lecture notes in English. Foreign students can participate by studying independently the material and by carrying out the exercise work and exam in English.
Timing:
The course is held in the spring semester, during periods 3 and 4. It is recommended to complete the course during the 4th year of studies.
Learning outcomes:
Upon completion of the course, the student

- can carry out structural analysis by using advanced numerical simulation technology
- has the knowledge and ability to develop methods for verification of model data and accuracy of numerical solutions
- can present results of calculations in writing
- knows different variational and energy principles of mechanics and can apply them in structural analysis
- knows the properties of different structural models and can formulate an appropriate and validated mathematical model for specific problems
- knows the mechanical models that are suitable for the analysis and dimensioning of steel, concrete and timber structures
- knows the special features of plate and shell structures from the viewpoint of structural design

Contents:
Introduction. Simulation governance. Principles of elasticity theory and calculus of variations. Bar, beam and arch structures. Plate and shell structures. Structural dynamics and stability.
Mode of delivery:
Face-to-face and independent study.
Learning activities and teaching methods:
Lectures and exercises 48 h, project work 24 h and independent work 63 h.
Target group:
Master level students in the study areas of structural engineering and engineering mechanics in the degree programs of civil and mechanical engineering, respectively.
Prerequisites and co-requisites:
Basic knowledge of statics, solid mechanics and differential & integral calculus.
Recommended optional programme components:
The course supports advanced courses in structural engineering and engineering mechanics.
Recommended or required reading:
Lecture notes and other electronic material.
Assessment methods and criteria:
The course is passed by partial exams during the course or by a final exam. A project work is also required.
Grading:
Numerical grading scale 1-5. Grade 0 stands for a fail.
Person responsible:
Professor Antti H. Niemi

450541A: Photoshop, Advanced Photomanipulation, 2 op

Voimassaolo: 01.08.2011 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Oulu School of Architecture
Arvostelu: 1 - 5, pass, fail
Opettajat: Asko Leinonen
Opintokohteen kielet: Finnish
Leikkaavuudet:

ay450541A Photoshop, Advanced Photomanipulation (OPEN UNI) 2.0 op

Ei opintojaksokuvauksia.

493300A: Principles of mineral processing, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Oulu Mining School
Arvostelu: 1 - 5, pass, fail
Opettajat: Saija Luukkanen
Opintokohteen kielet: English, Finnish
Leikkaavuudet:

ay493300A Principles of mineral processing (OPEN UNI) 5.0 op

ECTS Credits:
5 ECTS / 133 hours of work
Language of instruction:
Finnish; material mainly in English
Timing:
2nd period in the autumn. Recommended for the 3rd year students.
Learning outcomes:
Upon completion the course the student can explain the main unit process used in ore beneficiation and understands teh main chemical and mineralogical factors palying the key role in process development. The student is able to calculate the most relevant process related calculations, such as mass balances, concentrate recoveris and grindability. The student is aware of the environmental as well as H&S aspects of mineral processing.
Contents:
The main unit processes used in mineral processing. Understanding how the mineralogy and chemistry of the ore influences in the process development.
Mode of delivery:
Mainly face-to-face teaching
Learning activities and teaching methods:
Lectures, demonstrations, assignments
Target group:
Student with mineral processing as major; students of mining engineering, geosciences and process engineering
Prerequisites and co-requisites:
-
Recommended optional programme components:
-
Recommended or required reading:
The material provided during the course. B.A. Wills: Mineral processing technology
Assessment methods and criteria:
Final exam, home works and practicals, energy
Grading:
1-5/fail

Person responsible:
Saija Luukkanen
Working life cooperation:
No
Other information:
-

492601A: Principles of mining engineering, 5 op

Voimassaolo: 01.08.2021 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Oulu Mining School

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka-Pekka Ranta

Opintokohteen kielet: Finnish

ECTS Credits:
5 cr
Language of instruction:
Finnish
Timing:
Periodit 1-2 (timing for the seminar must be separately agreed with the teacher)
Learning outcomes:
After completing the course, students will have basic knowledge on technical solutions used in exploitation of mineral deposits, as well as on the common mining and mine planning methods, and on supporting topics such as feasibility studies, environmental impact assessments and working safety in mining.
Contents:
Technical solutions used in exploitation of mineral deposits, common mining and mine planning methods, supporting topics such as feasibility studies, environmental impact assessments and working safety in mining.
Mode of delivery:
Web course
Learning activities and teaching methods:
Web lectures, seminar presentation, and final exam
Target group:
OMS students, other students in applicable engineering fields, others interested in the subject. Especially BSc level students in Civil Engineering or Mechanical Engineering planning to transfer to the Master's Programme in Mining Engineering and Mineral Processing (study option Mining Engineering)
Assessment methods and criteria:
Evaluation methods: Seminar presentation and final exam.
Grading:
5-1, failed
Person responsible:
Jukka-Pekka Ranta (responsible) and Jyri Meriläinen

477524S: Process Optimization, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Aki Sorsa

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay477524S	Process Optimization (OPEN UNI)	5.0 op
477504S	Process Optimization	4.0 op

ECTS Credits:
5 ECTS /135 hours of work
Language of instruction:
English
Timing:
Spring semester, the 3th period. Recommended for 1st year M.Sc. students.
Learning outcomes:
Student can use and apply standard unconstrained and constrained optimization methods. Student understands the basic of evolutionary optimization algorithms and can use them. Student can define and identify optimization problems. Student is able to summarize the role of optimization in process engineering.
Contents:
Basic concepts of optimization. Optimization of unconstrained and constrained functions. Linear programming. Trajectory optimization. Evolutionary algorithms in optimization. Applications in process engineering.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
The amount of guided teaching is 40 hrs. Contact teaching includes, depending on situation, lectures, group work and tutored group work. During self-study time student does independent or group work.
Target group:
M.Sc. students of Process and Environmental Engineering and M.Sc. students interested in process optimization. Exchange and other international students.
Prerequisites and co-requisites:
No course requirements.
The course uses numerical methods in solving optimization problems. Mathematics needed is not specifically taught during the course and thus, if needed, students must independently obtain the information.
Recommended optional programme components:
See prerequisites.
Recommended or required reading:
Lecture notes and material, other literature and other sources of information.
Suggested reading materials. Ray, W.H. & Szekely, J. (1973) Process Optimization with Applications in Metallurgy and Chemical Engineering. John Wiley & Sons.
Assessment methods and criteria:
This course uses continuous assessment that includes homework and classroom or home exams.
Grading:
The course unit uses a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
Aki Sorsa
Working life cooperation:
No

477501A: Process dynamics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Aki Sorsa

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay477501A	Process Control Engineering I	5.0 op
470431A	Process Control Engineering I	5.0 op

ECTS Credits:
5 ECTS /135 hours of work
Language of instruction:
Finnish/English. The main lecturing language is Finnish, but the course can also be taken in English with some special arrangements.
Contact the responsible person.

Timing:
Negotiable (for the English version).
Learning outcomes:
After the course, the student understands the basic principles of dynamical behaviour of different processes, can write dynamic mass and energy balances for unit processes, and can solve these with the help of the transfer function approach. He knows also the connection between process control and process dynamics.
Contents:
Basics of process models and dynamics. Dynamic models. Lumped and distributed parameter models. Practical examples of different unit processes such as chemical reactors and heat exchangers. Modelling of large-scale processes.

Mode of delivery:
Negotiable (the course can be taken in English with some special arrangements - contact the responsible person).
Learning activities and teaching methods:
Solving exercise problems; textbook.
Target group:
Exchange and other international students (for the English version).
Prerequisites and co-requisites:
No course requirements.
The course deals with mass, component and energy balances, differential equations and transfer functions. Prior knowledge about these promote learning. Mathematics is not specifically taught during the course and thus, if needed, students must independently obtain the information needed.
Recommended optional programme components:
The course forms a basis to the advanced courses in the field of control engineering.
Recommended or required reading:
Parts of the textbook used: Luyben, W.L.: Process Modeling, Simulation and Control for Chemical Engineers. McGraw Kogakusha Ltd., Tokyo 1973, 558 pp.
Assessment methods and criteria:
Homework and written/oral test

Grading:
The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail. Read more about assessment criteria at the University of Oulu webpage.
Person responsible:
Aki Sorsa
Working life cooperation:
No

477222A: Reactor Analysis, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Marja Mikola

Opintokohteen kielet: Finnish

Leikkaavuudet:

477202A	Reactor Analysis	4.0 op

ECTS Credits:
5 ECTS /133 hours of work
Language of instruction:
Finnish
Timing:
Period 2 (autumn term)
Learning outcomes:
By completing the course the student is able to explain the determination methods of the reaction rate from experimental data and he/she can illustrate the basics of deterministic modelling. On that basis, the student has skills to analyse the behaviour of ideal reactors and to perform initial reactor selection and sizing.

Contents:
Elementary reactions, kinetics of homogenous reactions. Reaction rate on the basis of experimental data. Modelling of ideal reactors. Yield, selectivity and reactor size. Heuristics for selecting reactor type and operating conditions.
Mode of delivery:
Lectures and small group exercises
Learning activities and teaching methods:
Lectures about 30 h, exercises about 10 h and self-study about 90 h.
Target group:
Bachelor students in process and environmental engineering, minor subject students
Prerequisites and co-requisites:
Objectives of Material and Energy Balances and Thermodynamic Equilibrium
Recommended optional programme components:
-
Recommended or required reading:
Lecture handouts
Levenspiel, O.: Chemical Reaction Engineering. John Wiley & Sons, 1972. or newer (parts)
Atkins, P.W.: Physical Chemistry, Oxford University Press, 2002. 7. edition or newer (parts)
Assessment methods and criteria:
Two midterm exams during the course, which can be replaced with final exam after the course and two exercises.
Grading:
The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
Marja Mikola
Working life cooperation:
No
Other information:
-

488209S: Renewable Energy, 5 op

Voimassaolo: 01.08.2019 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Huuhtanen, Mika Ensio

Opintokohteen kielet: English

ECTS Credits:
5 ECTS credits / 135 hours of work.
Language of instruction:
English
Timing:
Period 1
Learning outcomes:
The student is able to define different methods and techniques on renewable energy production field. The student can describe the energy production from renewable sources and is able to compare the environmental impacts of different ways of producing energy. He/she is able to identify main specific characters, challenges and driving forces in the field.
Contents:
Renewable energy production methods and technologies. Water and wind power, solar energy, biofuels, biomass conversion, side-streams utilization, power-to-X technologies, emissions and environmental aspects.
Mode of delivery:
Contact lectures
Learning activities and teaching methods:
Lectures 40h, self-study 95h
Target group:
Master’s degree students of Process and Environmental Engineering study programmes.
Prerequisites and co-requisites:
Course 488208A Energian tuotannon ja käytön perusteet is recommended.

Recommended optional programme components:
The course is pre-requirement for 488206S Sustainable Energy Project course.

Recommended or required reading:
Materials delivered via the Moodle environment.

Assessment methods and criteria:
Written final exam.
Read more about the course assessment and grading systems of the University of Oulu at https://www.oulu.fi/forstudents/assesment-criteria

Grading:
The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
University lecturer Mika Huuhtanen
Working life cooperation:
No
Other information:
This course has replaced the course 488202S Production and Use of Energy.

485404S: Road Design and Construction, 5 op

Voimassaolo: 01.08.2019 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Civil Engineering field

Arvostelu: 1 - 5, pass, fail

Opettajat: Veikko Pekkala

Opintokohteen kielet: Finnish

ECTS Credits:
5 ECTS / 135 h of work
Language of instruction:
Finnish
Timing:
The course unit is held in the spring smester during period 4
Learning outcomes:
By completing the course 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
Prerequisites and co-requisites:
485403A Basics of Road 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 in lectures
Assessment methods and criteria:
Examination and assignment(s)
Grading:
The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
Veikko Pekkala
Working life cooperation:
No

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 cr /133 hours of work
Language of instruction:
English
Timing:
Spring, period 3
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

477304A: Separation Processes, 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Muurinen, Esa Ilmari

Opintokohteen kielet: Finnish

Leikkaavuudet:

470323A Separation Processes 5.0 op

ECTS Credits:
5 ECTS / 133 hours of work
Language of instruction:
Finnish, can be completed in English as a book examination.
Timing:
Implementation in autumn semester during the 2nd period. It is recommended to complete the course on the third (Bachelor's) autumn semester.
Learning outcomes:
After the course the student is able to define the position of separation processes based on mass transfer in process and environmental engineering. He/she is capable of solving phase equilibrium problems in multistage separations for binary mixtures. The student is able to explain the phenomena behind the following separation processes: distillation, absorption, stripping, liquid-liquid extraction, supercritical extraction, crystallisation, adsorption, chromatography separation, membrane separations, and reactive separations. He/she recognises the equipment used for these processes and is able to compare the methods to each other with heuristic rules.
Contents:
Separation processes based on mass transfer in process and environmental engineering. Phase equilibrium problems in multistage separations for binary mixtures. Phenomena behind the following separation processes: distillation, absorption, stripping, liquid-liquid extraction, supercritical extraction, crystallisation, adsorption, chromatography separation, membrane separations, and reactive separations. Equipment used for these processes and is able to compare the methods to each other with heuristic rules, etc.
Mode of delivery:
Face-to-face teaching in Finnish. Book examination possible in English.
Learning activities and teaching methods:
Lectures 40 h, exercises 20 h, homework 15 h and self-study 58 h. For foreign students written examination based on given literature and homework.
Target group:
Bachelor's degree students of process and environmental engineering.
Prerequisites and co-requisites:
Knowledge of fundamentals on fluid mechanics, mass and heat transfer are recommended beforehand.

Recommended optional programme components:
This is one of the courses in which physical chemistry is used in the applications of process and environmental engineering. It is part of a stream that aims at skills needed in the phenomenon-based modelling and planning of industrial processes.
Recommended or required reading:
Seader, J.D., Henley, E.J. & Roper, D.K.: Separation Processes Principles. Wiley 2011, 821 p.; Noble, R.D. & Terry, P.A.: Principles of Chemical Separations with Environmental Applications. Cambridge 2004, Cambridge University Press.321 p.
Assessment methods and criteria:
Examination. The course can be completed with three intermediate exams in Finnish or one final exam. Homework assignments affect the course grade.
Read more about the course assessment and grading systems of the University of Oulu at https://www.oulu.fi /forstudents/assesment-criteria.
Grading:
The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
Laboratory manager Dr Esa Muurinen.
Working life cooperation:
No

485303A: Soil Mechanics, 5 op

Voimassaolo: 01.08.2019 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Civil Engineering field
Arvostelu: 1 - 5, pass, fail
Opettajat: Tuomela, Anne Marika
Opintokohteen kielet: Finnish

ECTS Credits:
5 ECTS credits / 135 hours of work
Language of instruction:
Finnish
Timing:
The course unit is held in the spring semester, during period 4
Learning outcomes:
Upon completion this course, the student will understand 1) the fundamentals of consolidation theory, 2) calculation of settlement, 3) stability of slopes, 4) lateral earth pressures and calculations, 5) braced excavation, 6) bearing capacity of soils.
Contents:
Settlement calculation, consolidation settlement, shear strength of soils, stresses in soil from surface load, slope stability, bearing capacity, earth retaining structures.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures (24 h) and calculation exercises (16 h) also independent work (95 h)
Target group:
Students in Bachelor program of civil engineering
Prerequisites and co-requisites:
Student has at least to have basic information about the soil formation and about different soils and their physical properties. She/He understands the current of water in the soil. He can name the soils and can calculate effective stresse. She/He understands the shear strengths of soils and significance of frost in the soil (for example a course 485301A basics of Geotechnics).
Recommended or required reading:
Lecture handout and other materials delivered in lectures, Principles of Geotechnical Engineering by Das B.M and Craig's Soil Mechanics by Craig R.F.
Assessment methods and criteria:
Examination
Grading:
The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
Anne Tuomela
Working life cooperation:
No

488213A: Sources and control of air pollution, 5 op

Voimassaolo: 01.08.2019 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Process and Environmental Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Satu Pitkäaho
Opintokohteen kielet: Finnish
Leikkaavuudet:

ay488204S	Air Pollution Control Engineering (OPEN UNI)	5.0 op

488204S Air Pollution Control Engineering 5.0 op

ECTS Credits:
5 ECTS
Language of instruction:
Finnish
Timing:
Implementation in autumn semester during 2 nd period.
Learning outcomes:
Student is able to explain what kind of air emissions originate from certain industries and power plants, and can explain their effects on environment and health. He/she can describe how air emissions are measured. Student is also aware of common air pollution control systems for different emissions (particulates, VOCs, SO2, NOx, CO2) and is able to design air pollution cleaning devices.
Contents:
Atmosphere and air pollutants. Air pollution effects and regulations. Emission measurements. General ideas in air pollution control.
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 30 h, exercises 12 h, homework 8 h and self-study 85 h.
Target group:
Bachelor's degree students of Process and Environmental Engineering.
Recommended or required reading:
de Nevers; N.: Air Pollution Control Engineering. 2nd ed. McCraw-Hill 2000. 586 s.
Assessment methods and criteria:
Written final exam or intermediate exams.

Grading:
The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
Satu Pitkäaho and Esa Turpeinen

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 / 135 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. The student can draw a free body diagram of the force system and then solve the unknown forces by using equations of equilibrium. The student 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, the student can draw shear force and bending moment diagrams for beam structures.
The course gives ability for understanding static equilibrium, ability for determining force balance in structures and readiness for later studies.
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 Bachelor 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

461011A: Strength of Materials II, 7 op

Voimassaolo: - 31.07.2021
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Laukkanen, Jari Jussi
Opintokohteen kielet: Finnish
Leikkaavuudet:

461104A	Strength of materials II	5.0 op

Ei opintojaksokuvauksia.

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 / 135 hours of work
Language of instruction:
Lectures in Finnish, foreign students follow the course by reading independently the books in English and take 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 year spring semester.
Learning outcomes:
After the course, the student can determine stresses and strains of structures under loading. The student 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.
The main basic concepts of strength of materials and capabilities for sizing the simplest basic construction cases such as traction and compression rods, torsion rods and straight beams.
Mode of delivery:
Implemented as face-to-face -teaching.
Learning activities and teaching methods:
Lectures 56 h / exercises 52 h / independent work of solving homework problems 27 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, Otatieto 2002; Karhunen, J. & al.: Lujuusoppi, Otatieto 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

488506S: Sustainable Urban Energy, 5 op

Voimassaolo: 01.08.2018 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Eva Pongracz

Opintokohteen kielet: English

ECTS Credits:
5 cr/135 hours of work
Language of instruction:

English
Timing:
Period 4, on-line course
Learning outcomes:
The student can explain the concepts and legislative requirements for zero energy buildings and positive energy districts. The student will gain an understanding of the key technologies and key performance indicators (KPIs) of energy sustainable dwellings and sustainable city structures. The student will be able to calculate energy needs of buildings as well as greenhouse gas (GHG) emissions associated with energy consumption. The student can apply the psychometric chart and able to size and select suitable heating, ventilation and air conditioning (HVAC) technologies for different climate zones. The student can also apply energy modelling tools and is able to size building-integrated renewable energy technologies. The student calculate the renewable energy generation potential and make an economic assessment of the applied technologies in terms of payback time and net energy costs.
Contents:
Energy transition in cities, short and long-term strategies, features and KPIs of sustainable cities. Legislation and standards regarding building energy efficiency and urban energy; city energy planning for the 2030 and 2050 horizons. Building planning for energy efficiency, zero energy buildings, energy audits. Building integrated renewable energy generation and passive solar energy utilization. Basics of HVAC technologies ensuring indoor comfort and health. Applying the psychometric chart for different climate zones. Energy efficiency renovation, calculating energy efficiency gains and GHG reduction potential. Building skins and energy storage in the building structure. Practical examples and emerging technologies.
Mode of delivery:
On-line course, with pre-recorded video lectures, learning material and exercises. Live video conference and discussion.
Learning activities and teaching methods:
Self-learning, and self-assessment. Video lectures and tutorials for the calculation exercises. Learning tasks and calculation exercises. On-line and face-to-face consultation.
Target group:
Master's students of environmental engineering, especially of sustainable energy systems orientation; Doctoral students are also welcome to participate.
Recommended or required reading:
Lecture slides and information on recommended reading material will be provided during the course.

Assessment methods and criteria:
Grading of learning tasks, calculation and sizing exercises. Self-evaluation and self-assessment.
Grading:
The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.
Person responsible:
Prof. Eva Pongrácz

477401A: Thermodynamic Equilibria, 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Anne Hietava

Opintokohteen kielet: Finnish

Leikkaavuudet:

470611A	Metallurgy Processes	7.0 op

ECTS Credits:
5 cr / 135 hours of work.
Language of instruction:
Finnish
Timing:
The course is held in the autumn semester, during period I. It is recommended to complete the course at the 2nd autumn semester.
Learning outcomes:

Student is capable of defining chemical equilibria of the systems that are related to industrial processes and understands the relevance of equilibria (and their computational determination) as a part of process analysis, planning and control. Additionally, (s)he can define a meaningful system to be considered in computation thermodynamics; i.e. (s)he can create a computationally solvable problem based on technical problem that in itself is not solvable computationally.

Contents:
Concepts of entalphy (H), entropy (S) and Gibbs free energy (G). The effect of temperature and pressure on H, S and G. Chemical and phase equilibria. Activity and activity coefficient. Calculation of thermodynamic equilibria using equilibrium constant as well as Gibbs free energy minimisation.

Mode of delivery:
Classroom education and remote education

Learning activities and teaching methods:
Lectures (26 hours), software exercises (4 hours) as well as other exercises. Only in Finnish.

Target group:
Students of Process and Environmental Engineering

Prerequisites and co-requisites:
'Basic Principles in Chemistry' and 'Material and Energy Balances' or corresponding knowledge is recommended as prerequisite.

Recommended optional programme components:
This is one of the courses in which physical chemistry is used in the applications of process and environmental engineering. It is part of a education that aims at skills needed in the phenomenon-based modelling and planning of industrial processes.

Recommended or required reading:
Material will be distributed during lectures and exercises. It is also available via courses Moodle-site.

Assessment methods and criteria:
Students are required to make a portfolio consisting of a learning diary and exercices. Please note that the course is organised only in Finnish.

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

Person responsible:
Postdoctoral researcher Anne Hietava

Working life cooperation:
There is no direct working life cooperation in this course.

Other information:
It is highly recommended that the students are present already in the first lecture, since it is not possible to come along after the course has already begun.

455511P: Visual Arts I, 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Oulu School of Architecture

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay455511P	Visual Arts I (OPEN UNI)	5.0 op

ECTS Credits:
5

Language of instruction:
Finnish

Timing:
Autumn term 1-2

Learning outcomes:
To deal with different aspects of visual expression, to expand general knowledge relative to the various fields of art and to develop independent creative expression.
After completing the course the student is able to comprehend various sides of visual expression and can implement these skills in exercise work.

Contents:
Object and spatial drawing, classical model drawing, designing and modelling.
Mode of delivery:
Contact teaching and independent studying.
Learning activities and teaching methods:
lectures and/ or contact teaching 6 hours and contact teaching and/ or group guidance 92hours. 13 tutorials, 3 lectures.
Target group:
1.nd year students.
Prerequisites and co-requisites:
-
Recommended or required reading:
Supplemental reading list will be supplied during the course.
Assessment methods and criteria:
Based on exercises.
Grading:
1-5
Person responsible:
Prof. Matti Sanaksenaho.
Working life cooperation:
Students are initiated in the artist's work through guidance of a professional artist.

455512P: Visual Arts II, 3 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Oulu School of Architecture

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay455512P Visual Arts II (OPEN UNI) 3.0 op

ECTS Credits:
3
Language of instruction:
Finnish
Timing:
Spring term 1-2
Learning outcomes:
To deal with different aspects of visual expression, to expand general knowledge relative to the various fields of art and to develop independent creative expression.
After completing the course the student is able to comprehend various sides of visual expression and can implement these skills in exercise work.
Contents:
Classical model drawing and various applications of composition and colour theory. The relationship between architecture and colour as well as art and space is studied during the course.
Mode of delivery:
Contact teaching and independent studying.
Learning activities and teaching methods:
lectures and/ or contact teaching 6 hours and contact teaching and/ or group guidance 92 hours. 13 tutorials, 3 lectures.
Target group:
2.nd year students
Prerequisites and co-requisites:
-
Recommended or required reading:
Supplemental reading list will be supplied during the course.
Assessment methods and criteria:
Based on exercises.

Grading:
1-5
Person responsible:
Prof. Matti Sanaksenaho.
Working life cooperation:
Students are initiated in the artist's work through guidance of a professional artist.

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 / 135 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:
Mix of guided self-study work, face-to-face and video conference teaching sections and field visits (when viable).
Learning activities and teaching methods:
Lectures (30 h), field visits (5 h), exercises and other assignments (60 h) and self-study (38 h).

Target group:
Students in master program of Environmental and 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: 477013P Introduction to Process and Environmental Engineering (previously 477011P and 488010P).
Recommended or required reading:
Lecture hand-outs & "Lindquist, A., 2003. About water treatment. Helsingborg: Kemira Kemwater". Optional: RIL 124-2, Vesihuolto II; Metcalf & Eddy, Wastewater Engineering: Treatment and Reuse; AWWA, Water quality & treatment; AWWA, Water treatment plant design.
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 firsthand how to deal with some of the most common issues related to water and wastewater purification systems.