Opasraportti

Department of Process and Environmental Engineering (2013 - 2014)

Department of Process and Environmental Engineering

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BACHELOR'S DEGREE

In the first three years of the programme, a bachelor's degree in engineering is completed. The studies in the degree are uniform for all students in the programme. The degree provides excellent and wide-range abilities and produces the potential for employment in basic-level design and operating jobs in process and environmental engineering.

The industry-branch-independent, and phenomena-based approach of this educational programme provides students with excellent abilities to apply the learned skills to areas in addition to fields of process engineering. The studies contain courses on industry-branch-independent mechanical and chemical processes occurring in the different branches of process industry, and on phenomena related to heat and mass transfer processes and the control thereof, and give students the ability to control, optimize, design and develop different processes. The learned processes are utilized in industry, environmental construction, and in water purification.

The bachelor's degree consists of subject studies in process and environmental engineering, basic studies in mathematics and science, and studies that will produce personal non-technical professional working-life skills. The studies are divided into three phases:

1. **Descriptive phase**: The student will be introduced to the target phenomena in process and environmental engineering and to the control thereof on a general level.
2. **Analytical phase:** The student's perspective will be broadened by modelling.
3. **Synthetic phase:** The technical design and development approach based on the analysis of phenomena and their control is emphasised during this phase of studies.

The bachelor-level studies of the programme can be divided to four entities of knowhow, to the so-called competence areas. In all these areas, the objectives mainly focus on the student's general basic level planning skills and abilities to expand his/her knowledge in the next two cycles of education (master's and doctoral studies).

The bachelor-level competence areas and their learning outcomes are the next:

1. **Phenomena-based modelling and design and the competence areas leading to those:** The student learns the basic principles of phenomena-based design and will be able to produce static and dynamic process models both in industrial and natural processes, as well as analyse physical, chemical, biological and geo-scientific phenomena occurring in those processes.
2. **Mastery of the entities for technical activities:** The student can evaluate the engineering activities as entities with the technological, economic, occupational safety and juridical factors.
3. **Command of technologies, skills and methods:** The student can use necessary calculating and drawing tools with needed methods and technologies.
4. **Working life skills:** The student masters information management and interaction skills which are needed during studying and working.

MASTER'S DEGREE

In the fourth and fifth study year of the Master of Science in technology degree program, the student will acquire abilities in challenging design, research and development tasks of the field and also a strong foundation and eligibility for further doctoral studies. After completing the master's level studies the student will be able to design and develop different processes also from the perspective of automatic control and optimization, and economic and environmental effects thereof. In addition, he/she will be familiar with safety, as well as human resources issues in engineering.

The student chooses a major (study option) line of study within, for the master's degree. The studies mainly consist of advanced -level courses in the area of the chosen study option:

The Degree Programme of Process Engineering has eight study options:

1. Automation Engineering
2. Bioproducts and Bioprocess Engineering
3. Chemical Engineering
4. Extractive Metallurgy
5. Mineral Processing
6. Industrial Energy and Environmental Engineering
7. Industrial Engineering
8. Water and Geo Engineering

The student studies the intermediate studies and advanced studies (Study Option Module 30/60 ECTS) and elective studies (30/60 ECTS). Elective studies have to include Advanced Practical Training (3 ECTS) and they can include language studies maximum 10 ECTS.

Master's thesis shall be written as the final work in the degree (30 ECTS).

In the master's degree the student has a lot of freedom of choosing courses and his/her knowhow is built through these personal choices.

Study option of Automation Technology: A student in this option is able to apply mathematical and graphical methods to the modelling of process dynamics, and further, to use these dynamical models in the control design, fault diagnostics and the optimization of process functions. After completing the studies for automation technology, (s)he will be able to design the instrumentation as well as the system-level automation solutions required by the target process. (S)he is also able to advance his/her skills also in the other application areas of automation.

Study option of Bioproducts and Bioprocess Engineering:

1) Specialization in Bioproduct Technology will provide competence to work in the traditional wood processing industry and in the new emerging field of biorefining. The students will have an insight into the value chain of the utilization of renewable natural resources from raw materials to the finished end products. The students will gain understanding in the environmental aspects of bioproduct technologies and in the sustainable use of natural resources. After the completion of these studies the students will be a specialist in the field of biomass processing technologies and related phenomena, and will understand the raw material and processing requirements for various product applications.

2) Specialization in Bioprocess Engineering will provide competence to work in the industry where the expertises from the phenomena in industrial biotechnology, in process engineering and/or in environmental engineering are required. The students will be able to recognize the requirements set by the biochemical phenomena for the industrial processes. After completion of the studies in Bioprocess Engineering, the students will know the essential phenomena in bioprocess engineering and can apply them in different kind of bioprocesses.

Study option of Chemical Engineering: In chemical engineering study option the basic knowledge of unit operations development in chemical engineering and process design given in bachelor studies is deepened. Professional skills can be improved by complementing the minimum requirements by studies in the fields of environmental engineering, industrial engineering, work sciences or control engineering. Also, the abilities given by the study module can be complemented according to personal interests, e.g. to mechanical engineering or deepening the knowledge on technical mathematics and natural sciences.

After completing the study option on chemical engineering the student masters the raw material and energy streams of chemical subprocesses and recognizes the essential control parameters of them. The student is also able to take into account the non-idealities and simultaneous phenomena in processes and evaluate the operation of process facilities.

Study option of Extractive Metallurgy: A graduate of extractive metallurgy will be able to utilize experimental, analytical and modelling tools that are required in the research and development of pyrometallurgical processes in which iron, steel and ferroalloys are produced. Additionally, (s)he can identify how these research methods are connected to the metallurgical applications (i.e. processes, materials and environmental effects) and to the phenomena (i.e. reactions, transport phenomena, structural changes), that take place in these applications. These metallurgical skills are supported by additional knowledge and skills of e.g. process engineering, materials science and engineering, control engineering, mineral processing, industrial engineering or environmental engineering.

Study option of Mineral Processing: A student graduating as the Mineral Processing study option as his/her major, will command the economic, legislative, geological and technological principles of mining research and development, starting from mine opening, to its closure. The Mineral Processing graduate will especially know the methods used in mining engineering, ore quarrying, mineral processing, and in mine environmental engineering, as well as the environmental effects of mining, and will master the safety issues and social responsibility of mining.

For the University of Oulu students in the Mineral Processing study option it is possible to study for a double degree with the Luleå University of Technology, Sweden. For this, an exchange period at LTU is required. There is a separate student selection for the double degree. More information on the double degree is available by contacting the study counsellors or the department.

Study option of Industrial Energy and Environmental Engineering gives the basic abilities to the environmentally benign process design based on both external and internal measures in the plant. Furthermore, Industrial energy and environmental engineering –oriented Masters have knowledge on sustainable energy production processes and energy distribution. The starting point of this study option is the process design point of view, where especially process analysis, process evaluation, environmental engineering questions as well as sustainable production and production technologies play an important role. The Master of Science specialized in Industrial energy and environmental engineering is familiarized with typical stages in process design, sources of information and methodologies. The safety and environmental awareness as well as cost-efficiency evaluation are core competencies. The Master of Science has special know-how on e.g. utilization of catalysts in environmental applications, closed cycles in production plants, environmentally friendly raw materials, production technologies and products as well as life cycle analysis.

Study option of Industrial Engineering will give the student a broad understanding of production management, manufacturing companies, supply chains and projects. A master of science in technology, specialized in this area, is familiar with the management of production processes and the safety principles of the process industry. The graduate will have perspectives on abilities in planning, evaluation and development of organization and staff, and in the management of change. In addition, the student is able to evaluate people as a part of the working environment.

Study option of Water and Geo Engineering: A Master of Science in water resources and environmental engineering knows the basic processes that govern water flow and transport of contaminants, (s)he know how to model and assess hydraulics of surface waters and groundwater and how to dimension hydraulic structures and sub-surface drainage systems. A knowledge on environmental protection and how this is included in water resources management will be attained. The education includes insight into environmental legislation and a good knowledge on the environmental impact assessment process. Students learn how to calculate and quantify impacts of water resources development and various land use activities. The education focus on understanding unit operations in water and wastewater treatment and to dimension purification plants and the knowledge on municipal and industrial solid waste management and waste minimization. Different sampling methods for air quality, water, soils and waste will be known.

The MSc knows how to assess geotechnical requirements of urban construction work and analyses results of ground surveys and knows the basis of geotechnical design. The education and research focus on northern conditions and the engineer know the impact of frost and winter on drainage plans and land-fill bottom structures.

The Master of Science that specialise in water engineering knows how to assess the role of hydrological processes using different known models and modeling methods. The students will know key processes effecting water quality and understand the role of land use activities on surface water quality. The environmental engineer will know how to model nutrient emission, retention and transport processes in lakes and rivers. The role of flood and dam safety issues is understood.

The Master of Science that specialize in urban and civil engineering knows how to assess soil structures and their geotechnical properties relevant for construction works. The student knows how to select relevant soil research methods, how to use different computer programs used in design and dimensioning. Soil contamination issues are understood and methods known for remediation and soil and water protection. The education provides national aa-sertificate required for designers of urban infrastructure works, and with some additional credits, also the AA requirements for foundation engineering works.

Tutkintorakenteet

Bachelor's degree of Process Engineering

Tutkintorakenteen tila: published

Lukuvuosi: 2013-14

Lukuvuoden alkamispäivämäärä: 01.08.2013

Basic and Intermediate Studies (99.5 - 100 op)

Phenomena-based modelling and design and the competence areas leading to those.

A431120: Basic and Intermediate Studies, Process Engineering, 99,5 - 109,5 op
Compulsory
477011P: Introduction to Process and Environmental Engineering I, 5 op
488010P: Introduction to Process and Environmental Engineering II, 5 op
031010P: Calculus I, 5 op
031017P: Differential Equations, 4 op
031019P: Matrix Algebra, 3,5 op
031021P: Probability and Mathematical Statistics, 5 op
031022P: Numerical Analysis, 5 op
761121P: Laboratory Exercises in Physics 1, 3 op
761101P: Basic Mechanics, 4 op
761103P: Electricity and Magnetism, 4 op
780109P: Basic Principles in Chemistry, 4 op
780112P: Introduction to Organic Chemistry, 4 op
780122P: Introductory Laboratory Course in Chemistry, 3 op
477201A: Material and Energy Balances, 5 op
477401A: Thermodynamic Equilibria, 5 op
477301A: Momentum Transfer, 3 op
477302A: Heat Transfer, 3 op
477303A: Mass Transfer, 3 op
477202A: Reactor Analysis, 4 op
477402A: Solid Inorganic Materials, 5 op
477101A: Particle Technology, 3 op
477102A: Bulk Solids Handling, 4 op
477501A: Process dynamics, 5 op
477502A: Process Control Engineering II, 5 op

Module Preparing for the Option, Module 1 (40 op)

Mastery of the entities for technical activities.

A431121: Module Preparing for the Option, Module 1, 29 - 40 op
Compulsory
555220P: Basic Course in Industrial Engineering and Management, 3 op
555221P: Introduction to Production, 2 op
555260P: Basic Course in Occupational Safety and Wellbeing at Work, 3 op
555280P: Basic Course of Project Management, 2 op
477021A: Laboratory Exercises of Process Engineering, 4 op
477304A: Separation Processes, 5 op
477103A: Bioproduct Technology, 3 op

477203A: Process Design, 5 op
488309A: Biocatalysis, 5 op
488302A: Basics of Biotechnology, 5 op
477001A: Practical Training, 3 op

Module Preparing for the Option, Module 2 (21.5 op)

Command of technologies, skills and methods.

A431122: Module Preparing for the Option, Module 2, 20,5 - 21,5 op
Compulsory
477033A: Programming in Matlab, 2,5 op
477032A: AutoCAD in Process and Environmental Engineering, 2 op
031044A: Mathematical Methods, 4 op
477601A: Process Automation Systems, 4 op
477602A: Control System Analysis, 4 op
477603A: Control System Design, 4 op

Supplementary Module (10 op)

Working life skills.

902011P Technical English 3 * Instead of English, the student can choose another foreign language (more information in the Study Guide)

A431146: Supplementary Module/Bachelor's Degree, 10 op
E
030005P: Information Skills, 1 op
477000P: Planning of Studies and Career, 1 op
901008P: Second Official Language (Swedish), 2 op
900009P: Second Official Language (Finnish), 2 op
You can choose also another language than English.
902011P: Technical English 3, 6 op
903012P: Technical German 3, 6 op

Bachelor's Thesis and studies included (10 op)

477990A: Bachelor's Thesis / Process Engineering, 8 op
477994A: Maturity Test / Bachelor of Science in Process Engineering Technology, 0 op
900060A: Technical Communication, 2 op

Bachelor's degree of Environmental Engineering

Tutkintorakenteen tila: published

Lukuvuosi: 2013-14

Lukuvuoden alkamispäivämäärä: 01.08.2013

Basic and Intermediate Studies (99.5 - 100 op)

Phenomena-based modelling and design and the competence areas leadin to those.

A432120: Basic and Intermediate Studies, Environmental Engineering, 99,5 - 120,5 op
Compulsory
477011P: Introduction to Process and Environmental Engineering I, 5 op
488010P: Introduction to Process and Environmental Engineering II, 5 op

488201A: Environmental Ecology, 5 op
488102A: Hydrological Processes, 5 op
031010P: Calculus I, 5 op
031017P: Differential Equations, 4 op
031019P: Matrix Algebra, 3,5 op
031021P: Probability and Mathematical Statistics, 5 op
031022P: Numerical Analysis, 5 op
761121P: Laboratory Exercises in Physics 1, 3 op
761101P: Basic Mechanics, 4 op
761103P: Electricity and Magnetism, 4 op
780109P: Basic Principles in Chemistry, 4 op
780112P: Introduction to Organic Chemistry, 4 op
780122P: Introductory Laboratory Course in Chemistry, 3 op
477201A: Material and Energy Balances, 5 op
477401A: Thermodynamic Equilibria, 5 op
477301A: Momentum Transfer, 3 op
477302A: Heat Transfer, 3 op
477303A: Mass Transfer, 3 op
477202A: Reactor Analysis, 4 op
477101A: Particle Technology, 3 op
477102A: Bulk Solids Handling, 4 op
477203A: Process Design, 5 op

Module Preparing for the Option, Module 1 (40 op)

Mastery of the entities for technical activities.

A432121: Module Preparing for the Option, Module 1, 20 - 40 op
Compulsory
555221P: Introduction to Production, 2 op
555260P: Basic Course in Occupational Safety and Wellbeing at Work, 3 op
555220P: Basic Course in Industrial Engineering and Management, 3 op
555280P: Basic Course of Project Management, 2 op
488309A: Biocatalysis, 5 op
488302A: Basics of Biotechnology, 5 op
488012A: Environmental Legislation, 5 op
488115S: Geomechanics, 5 op
488104A: Industrial and municipal waste management, 5 op
477304A: Separation Processes, 5 op

Module Preparing for the Option, Module 2 (20.5 op)

Command of technologies, skills and methods.

A432122: Module Preparing for the Option, Module 2, 19,5 - 20,5 op
Compulsory
477033A: Programming in Matlab, 2,5 op
477032A: AutoCAD in Process and Environmental Engineering, 2 op
031044A: Mathematical Methods, 4 op
477601A: Process Automation Systems, 4 op
477501A: Process dynamics, 5 op
488001A: Practical Training, 3 op

Supplementary Module (10 op)

Working life skills.

902011P Technical English 3 * Instead of English, the student can choose another foreign language (more information in the Study Guide)

A432146: Supplementary Module/Bachelor's Degree, 10 op

E

030005P: Information Skills, 1 op
477000P: Planning of Studies and Career, 1 op
901008P: Second Official Language (Swedish), 2 op
900009P: Second Official Language (Finnish), 2 op

You can choose also another language than English.

902011P: Technical English 3, 6 op
903012P: Technical German 3, 6 op

Bachelor's Thesis and studies included (10 op)

488990A: Bachelor's Thesis / Enviromental Engineering, 8 op
488994A: MaturityTest/Bachelor of Science in Environmental Engineering/Technology, 0 op
900060A: Technical Communication, 2 op

Master's Degree Programme (BCBU) in Environmental Engineering (BEE)

Tutkintorakenteen tila: published

Lukuvuosi: 2013-14

Lukuvuoden alkamispäivämäärä: 01.08.2013

Clean Production Orientation (120 op)

Two BEE/CP modules (Basic, Advanced) must in total make minimally **90 cr.** All courses in the **Basic Module** (28 cr) of the BEE/CP orientation are compulsory. The **Advanced Module** (about 62 cr) contains both compulsory and optional studies.

Basic Module of Clean Production 28 ECTS

A432225: Module of Option / Basic Module of Clean production, 28 - 31 op

Compulsory

030008P: Information Skills for foreign degree students, 1 op
900017Y: Survival Finnish Course, 2 op
900013Y: Beginners' Finnish Course 1, 3 op
488400A: Orientation to the BEE studies, 0 - 1 op
488002S: Advanced Practical Training, 3 op
488401A: Introduction to the Barents Region, 2 op
488402A: Sustainable Development, 3 op
477307S: Research Methodology, 5 op
477041S: Experimental Design, 5 op
477203A: Process Design, 5 op

Advanced Module of Clean Production about 62 ECTS

A432275: Advanced Module/Clean Production, 30 - 62 op

Compulsory

488405S: Environmental Issues in the Barents Region, 5 op
488203S: Industrial Ecology, 5 op
488202S: Production and Use of Energy, 5 op
477309S: Process and Environmental Catalysis, 5 op
488205S: Environmental Load of Process Industry, 4 op
488204S: Air Pollution Control Engineering, 5 op
488104A: Industrial and municipal waste management, 5 op

Optional; choose 30 ECTS

488201A: Environmental Ecology, 5 op
477310S: Advanced Catalytic Processes, 5 op

477503S: Simulation, 3 op
477209S: Chemical Process Simulation, 5 op
477306S: Non-ideal Reactors, 5 op
477206S: Advanced Process Design, 6 op
477305S: Flow Dynamics, 5 op
477311S: Advanced Separation Processes, 5 op
488206S: Sustainable Energy Project, 5 op

Water and Environment Orientation (120 op)

Two BEE/WE modules (Basic, Advanced) must in total make minimally **90 cr.** All courses in the **Basic Module** (28 cr) of the BEE/CP orientation are compulsory. The **Advanced Module** (about 62 cr) contains both compulsory and optional studies.

Basic Module of Water and Environment 28 ECTS

A432226: Module of Option/Basic Module of Water and Environment, 30 op
Compulsory
030008P: Information Skills for foreign degree students, 1 op
900017Y: Survival Finnish Course, 2 op
900013Y: Beginners' Finnish Course 1, 3 op
488400A: Orientation to the BEE studies, 0 - 1 op
488002S: Advanced Practical Training, 3 op
488401A: Introduction to the Barents Region, 2 op
488402A: Sustainable Development, 3 op
477307S: Research Methodology, 5 op
477041S: Experimental Design, 5 op
477203A: Process Design, 5 op

Advanced Module of Water and Environment about 62 ECTS

A432276: Advanced Module/Water and Environment, 60 op
Compulsory
488405S: Environmental Issues in the Barents Region, 5 op
488102A: Hydrological Processes, 5 op
488104A: Industrial and municipal waste management, 5 op
488108S: Groundwater Engineering, 5 op
488110S: Water and Wastewater Treatment, 5 op
488118S: Laboratory Exercises and Field Measurements in Environmental Engineering, 10 op
Optional, choose 29 ECTS
488103A: Environmental Impact Assessment, 4 - 8 op
488113S: Introduction to Surface Water Quality Modelling, 5 op
488117S: Water Resources Management, 5 - 7,5 op
488122S: Statistical Methods in Hydrology, 5 op
488123S: River Engineering and Hydraulic Structures, 5 op
488124S: Advanced Course in Hydrology, 5 op
488131S: Geoenvironmental Engineering, 5 op

The Master's Thesis and written maturity test (30 op)

Choose Master's Thesis compulsory 30 ECTS:

488997S Master's Thesis/ Master's Degree Programme (BCBU) in Environmental Engineering, Clean Production,
488998S Master's Thesis/ Master's Degree Programme (BCBU) in Environmental Engineering, Water and Environment

480429S: Maturity Test / Environmental Engineering, 0 op

Tutkintorakenteisiin kuulumattomat opintokokonaisuudet ja -jaksot

030001P: Orientation Course for New Students, 1 op

Opintojaksojen kuvaukset

Tutkintorakenteisiin kuuluvien opintokohteiden kuvaukset

A431120: Basic and Intermediate Studies, Process Engineering, 99,5 - 109,5 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Basic and Intermediate Studies
Laji: Study module
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Compulsory

477011P: Introduction to Process and Environmental Engineering I, 5 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Basic Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Aki Sorsa
Opintokohteen kielet: Finnish
Leikkaavuudet:

470219A	Introduction to Process Engineering	3.5 op

ECTS Credits:

5 cr

Language of instruction:

Finnish

Timing:

Implementation during periods 1-3

Learning outcomes:

Objective: To give insight to the whole perspective of process and environmental engineering and to familiarise the students with the terminology involved. The objective is also to outline the connections between process and environmental engineering and other fields closely related to them.
Learning outcomes: After the course, the student can analyse the process and environmental engineering aspects of an industrial process. He/She can, for example, divide the process into unit processes, analyse the process or a chain of processes based on the material balances, identify and evaluate the significance of essential mechanical, chemical and transport phenomena, analyse the control and process design aspects of a process etc. He/She can also evaluate the significance of different

aspects of process and environmental engineering to the overall production system when these aspects are further examined in forthcoming courses.

Contents:

The course divides into eight separate themes: 1. Unit processes and material balances. 2. Environmental impacts and their classification. 3. Mechanical phenomena. 4. Momentum, heat and mass transfer phenomena. 5. Chemical reactions and reactors. 6. The possibilities of biological process engineering. 7. Process dynamics and control. 8. Process measurements and measurability.

Mode of delivery:

Contact lectures

Learning activities and teaching methods:

Assignments (8 altogether) carried out in small groups and contact lectures supporting them (16 hours).

Target group:

Bachelor's degree students in the Department of Process and Environmental Engineering

Prerequisites and co-requisites:

None

Recommended optional programme components:

The course serves as an introduction to the studies in process and environmental engineering.

Recommended or required reading:

The material is provided during the contact lectures and through the course webpages. It is expected also that the students seek the material for completing the assignments independently.

Assessment methods and criteria:

The assignments (8 altogether) covering the course themes carried out in small groups.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilises a numerical grading scale 1-5 and fail.

Person responsible:

M.Sc. (eng) Aki Sorsa

Working life cooperation:

No.

Other information:

The assessment method utilised requires the attendance in contact lectures from the beginning of the course.

488010P: Introduction to Process and Environmental Engineering II, 5 op

Voimassaolo: 01.08.2013 -
Opiskelumuoto: Basic Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Fabritius, Timo Matti Juhani
Opintokohteen kielet: Finnish
Leikkaavuudet:

488011P	Introduction to Environmental Engineering	5.0 op
477012P	Introduction to Automation Engineering	5.0 op

ECTS Credits:

5 cr

Language of instruction:

Finnish

Timing:

Implementation in 4 th to 6 th periods.

Learning outcomes:

Students can examine industrial processes using the methods and perspectives of process and environmental engineering (e.g. environmental load of processes, use of land and water recourses, control and design of processes…) and they recognize the role of different areas of the process and environmental engineering, when these areas are considered in the forthcoming courses.

Contents:

1. Environmental thinking and industrial ecology. 2. Materials in production processes. 3. Water resources and land use. 4. Municipal and industrial water supply. 5. PI diagrams. 6. Process design. 7. Control and operation of processes.

Mode of delivery:

Classroom education

Learning activities and teaching methods:

Group exercises and contact-education that supports these exercises. Only in Finnish.

Target group:

Students of process and environmental engineering

Prerequisites and co-requisites:

None

Recommended optional programme components:

This course is an introduction to the other courses of process and environmental engineering.

Recommended or required reading:

Material will be distributed during lectures and exercises.

Assessment methods and criteria:

Group-exercises. Please note that the course is not organised for the English speaking students.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Failed, 1, 2, 3, 4 and 5.

Person responsible:

professor Timo Fabritius

Working life cooperation:

No.

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.

031010P: Calculus I, 5 op

Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Mathematics Division
Arvostelu: 1 - 5, pass, fail
Opettajat: Ilkka Lusikka
Opintokohteen kielet: Finnish
Leikkaavuudet:

ay031010P	Calculus I (OPEN UNI)	5.0 op

ECTS Credits:

5

Language of instruction:

Finnish

Timing:

Autumn semester, periods 1-3.

Learning outcomes:

After completing the course the student identifies concepts of vector algebra and can use vector algebra for solving problems of analytic geometry. The student can also explain basic characteristics of elementary functions and is able to analyse the limit and the continuity of real valued functions of one variable. Furthermore, the student can solve problems associated with differential and integral calculus of real valued functions of one variable.

Contents:

Vector algebra and analytic geometry. Limit, continuity, differential and integral calculus and applications of real valued functions of one variable. Complex numbers.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 55 h / Group work 22 h.

Target group:

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Prerequisites and co-requisites:

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Recommended optional programme components:

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Recommended or required reading:

Grossmann, S.I.: Calculus of One Variable; Grossmann, S.I.: Multivariable Calculus, Linear Algebra and Differential Equations (partly); Adams, R.A.: A Complete Course Calculus (partly).

Assessment methods and criteria:

Intermediate exams or a final exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 1-5.

Person responsible:

Ilkka Lusikka

Working life cooperation:

-

Other information:

-

031017P: Differential Equations, 4 op

Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Mathematics Division
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

800320A	Differential equations	5.0 op
031076P	Differential Equations	5.0 op

ECTS Credits:

4

Language of instruction:

Finnish

Timing:

Spring, period 4-6

Learning outcomes:

The students can apply differential equations as a mathematical model. They can identify and solve various differential equations and they have knowledge on basic solvability of differential equations. The student can use the Laplace transform as a solution method.

Contents:

Ordinary differential equations of first and higher order. Laplace transform with applications to differential equations.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 44 h / Group work 28 h.

Target group:

-

Prerequisites and co-requisites:

The recommended prerequisite is the completion of the course 031010P Calculus I.

Recommended optional programme components:

-

Recommended or required reading:

Kreyszig, E.: Advanced Engineering Mathematics

Assessment methods and criteria:

Intermediate exams or a final exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 1-5.

Person responsible:

Martti hamina

Working life cooperation:

-

Other information:

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031019P: Matrix Algebra, 3,5 op

Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Mathematics Division
Arvostelu: 1 - 5, pass, fail
Opettajat: Matti Peltola
Opintokohteen kielet: Finnish
Leikkaavuudet:

031078P	Matrix Algebra	5.0 op

ECTS Credits:

3,5

Language of instruction:

Finnish

Timing:

Autumn semester, periods 1-3

Learning outcomes:

After completing the course the student is able to apply arithmetic operations of matrices. He can solve system of linear equations by matrix methods and can apply iterative methods to find the solution of the system of linear equations. The student is able to recognise the vector space and can relate the consepts of linear transform and matrix. He can analyse matrices by the parameters, vectors and vector spaces of matrices. The student is able to diagonalize matrices and apply diagonalization to the simple applications.

Contents:

Vectors and matrices. Systems of linear equations. Vector spaces and linear transformations. The rank, nullity, row space and the column space of a matrix. The determinant of a matrix. Eigenvalues and eigenvectors of a matrix. The diagonalization with applications. The iterative methods of solving linear system of equations. The theorems of Gershgorin and Cayley- Hamilton.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 40 h / Group work 20 h.

Target group:

-

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Grossman, S.I. : Elementary Linear Algebra, David C. Lay: Linear Algebra and Its Applications.

Assessment methods and criteria:

Intermediate exams or a final exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 1-5.

Person responsible:

Matti Peltola

Working life cooperation:

-

Other information:

-

031021P: Probability and Mathematical Statistics, 5 op

Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Mathematics Division
Arvostelu: 1 - 5, pass, fail
Opettajat: Jukka Kemppainen
Opintokohteen kielet: Finnish
Leikkaavuudet:

ay031021P	Probability and Mathematical Statistics (OPEN UNI)	5.0 op

ECTS Credits:

5

Language of instruction:

Finnish

Timing:

Spring semester, periods 4-6

Learning outcomes:

After completing the course the student knows the key concepts of probability and the most important random variables and is able to use them in calculating probabilities and parameters of probability distributions. In addition, the student is able to analyze statistical data by calculating interval and point estimates for the parameters. The student is also able to formulate statistical hypotheses and test them.

Contents:

The key concepts of probability, random variable, parameters of probability distributions, estimation of parameters, hypothesis testing.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 44 h/Exercises 22 h/Self-study 68 h.

Target group:

-

Prerequisites and co-requisites:

The recommended prerequisites are the course 031010P Calculus I and some parts of the course 031011P Calculus II.

Recommended optional programme components:

-

Recommended or required reading:

Milton, J.S., Arnold, J.C. (1992): Introduction to Probability and Statistics.

Assessment methods and criteria:

Intermediate exams or a final exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 1-5.

Person responsible:

Jukka Kemppainen

Working life cooperation:

-

Other information:

-

031022P: Numerical Analysis, 5 op

Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Mathematics Division
Arvostelu: 1 - 5, pass, fail
Opettajat: Marko Huhtanen
Opintokohteen kielet: Finnish

ECTS Credits:

5

Language of instruction:

Finnish

Timing:

Spring semester, periods 4-5

Learning outcomes:

The student recognizes what numerical solution methods can be used to solve some spesific mathematical problems, can perform the required steps in the numerical algorithm and is able to perform the error analysis.

Contents:

Numerical linear algebra. Numerical methods for systems of equations, Basics of the approximation theory. Numerical quadratures. Numerical methods for ordinary and partial differential equations.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 44 h / Group work 22 h.

Target group:

-

Prerequisites and co-requisites:

The recommended prerequisite is the completion of the courses Calculus I and II, Differential Equations and Matrix algebra.

Recommended optional programme components:

-

Recommended or required reading:

J. Douglas Faires and Richar L. Burden, Numerical methods; Alfio Quarteroni, Riccardo Sacco, Fausto Saleri, Numerical mathematics

Assessment methods and criteria:

Intermediate exams or a final exam.

Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 1-5.

Person responsible:

Marko Huhtanen

Working life cooperation:

-

Other information:

-

761121P: Laboratory Exercises in Physics 1, 3 op

Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Department of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

761115P	Laboratory Exercises in Physics 1	5.0 op
761118P-01	Mechanics 1, lectures and exam	0.0 op
761115P-02	Laboratory Exercises in Physics 1, laboratory exercises	0.0 op
761115P-01	Laboratory Exercises in Physics 1, lecture and exam	0.0 op
761114P-01	Wave motion and optics, lectures and exam	0.0 op
761113P-01	Electricity and magnetism, lectures and exam	0.0 op

ECTS Credits:

3 credits

Language of instruction:

The lectures and the instruction material will be in Finnish. The laboratory experiments will be made in groups guided either in Finnish or in English.

Timing:

Autumn, spring.

Learning outcomes:

The student can safely make physical measurements, use different measurement tools, read different scales, handle the data, calculate the error estimations and make a sensible report of his laboratopy measurements.

Contents:

The skill to make laboratory measurements is important for physicists. This is an introductory course how to make physical measurements and how to treat the measured data. Laboratory works are made in groups. The laboratory security is an essential part also in physics. Measurements are made with different instruments. As a result the most probable value is determined as well as its error. The skills obtained during this course can be applied in the other laboratory courses Laboratory exercises in physics 2 and 3.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 12 h, exercises 20 h (5 x 4 h). Five different works will be made during the course in groups. Self-study 48 h.

Target group:

No specific target qroup

Prerequisites and co-requisites:

No specific prerequisites

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously

Recommended or required reading:

A booklet: Fysiikan laboratoriotyöt I, laboratoriotöiden työohje. Course material is in Finnish. A few English material is available in teaching laboratory.

Assessment methods and criteria:

Written reports of the experiments and one written examination.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Kari Kaila

Working life cooperation:

No work placement period

Other information:

https://wiki.oulu.fi/display/761121P/
Registration for the course and exams will be found by using the code 761121P-01

761101P: Basic Mechanics, 4 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Physics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

761118P Mechanics 1 5.0 op
761118P-01 Mechanics 1, lectures and exam 0.0 op
761118P-02 Mechanics 1, lab. exercises 0.0 op
761111P-01 Basic mechanics, lectures and exam 0.0 op
761111P-02 Basic mechanics, lab. exercises 0.0 op
761111P Basic mechanics 5.0 op
761101P2 Basic Mechanics 4.0 op

ECTS Credits:

4 credits

Language of instruction:

The lectures will be in Finnish. The textbook is in English and exercises are selected from the textbook. For further information, contact the responsible person of the course.

Timing:

Autumn

Learning outcomes:

The student is able to describe the basic concepts of mechanics and to apply those when solving the problems related to mechanics.

Contents:

We encounter many phenomena related to mechanics in our everyday life. Most engineering sciences are based on mechanics and mechanics forms the basis of many other fields of physics, including modern physics.
Contents in brief: Short summary of vector calculus. Kinematics, projectile motion and circular motion. Newton's laws of motion. Work and different forms of energy. Momentum, impulse and collisions. Rotational motion and moment of inertia. Torque and angular momentum. Rigid body equilibrium problems. Gravitation. Periodic motion. Fluid mechanics.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 32 h, 8 exercises (16 h), self-study 59 h

Target group:

For the students of the University of Oulu

Prerequisites and co-requisites:

Knowledge of vector calculus and basics of differential and integral calculus

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously

Recommended or required reading:

Text book: H.D. Young and R.A. Freedman: University physics, Addison-Wesley, 13th edition, 2012, chapters 1-14. Also older editions can be used.
Lecture material: Finnish lecture material will be available on the web page of the course.
Course material availability can be checked here.

Assessment methods and criteria:

Four mini examinations and end examination or final examination
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Anita Aikio

Working life cooperation:

No work placement period

Other information:

https://wiki.oulu.fi/display/761101P/

761103P: Electricity and Magnetism, 4 op

Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Department of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

761119P Electromagnetism 1 5.0 op
761119P-01 Electromagnetism 1, lectures and exam 0.0 op
761119P-02 Electromagnetism 1, lab. exercises 0.0 op
761113P-01 Electricity and magnetism, lectures and exam 0.0 op
761113P-02 Electricity and magnetism, lab. exercises 0.0 op
761113P Electricity and magnetism 5.0 op
766319A Electromagnetism 7.0 op

ECTS Credits:

4 credits

Language of instruction:

The lectures will be in Finnish. The textbook is in English and exercises are selected from the textbook. For further information, contact the responsible person of the course.

Timing:

Spring

Learning outcomes:

The student is able to describe the basic concepts of electricity and magnetism and to apply those when solving the problems related to electromagnetism.

Contents:

Electromagnetic interaction is one of the four fundamental interactions in physics and many phenomena like light, radio waves, electric current, magnetism and formation of solid matter are based on electromagnetism. The current technological development is largely based on applications of electromagnetism in energy production and transfer, telecommunications and information technology. Contents in brief: Coulomb's law. Electric field and potential. Gauss's law. Capacitors and dielectrics. Electric current, resistors, electromotive force and DC circuits. Magnetic field, motion of a charged particle in electric and magnetic fields, and applications. Ampère's law and Biot-Savart law. Electromagnetic induction and Faraday's law. Inductance and inductors. R-L-C circuits, alternating current and AC circuits.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 32 h, 6 exercises (12 h), self-study 63 h

Target group:

For the students of the University of Oulu.

Prerequisites and co-requisites:

Knowledge of vector calculus and basics of differential and integral calculus are needed.

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously

Recommended or required reading:

Text book: H.D. Young and R.A. Freedman: University physics, Addison-Wesley, 13th edition, 2012, chapters 21-31. Also older editions can be used.
Lecture material: Finnish lecture material will be available on the web page of the course.

Course material availability can be checked here.

Assessment methods and criteria:

Four mini examinations and end examination or final examination
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Anita Aikio

Working life cooperation:

No work placement period

Other information:

https://wiki.oulu.fi/display/761103P/

780109P: Basic Principles in Chemistry, 4 op

Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Minna Tiainen
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
780101P	Introduction to Physical Chemistry	7.0 op
780101P2	Physical Chemistry I	4.0 op
780107P	Basic Course in Inorganic and Physical Chemistry	7.5 op
780152P	Inorganic and Physical Chemistry I	7.5 op
780153P	General and Inorganic Chemistry	7.5 op
780154P	Basic Inorganic Chemistry	7.5 op

ECTS Credits:

4 credits/107 hours of work

Language of instruction:

Finnish

Timing:

1st autumn

Learning outcomes:

Upon completion of the course, the student will be able to display an understanding of basic chemistry phenomenon; equilibrium of acids and bases, chemical equilibrium, redox reactions and stoichiometry.

Contents:

Introduction to chemistry, stoichiometry, redox reactions, chemical equilibrium, the equilibrium of acid and bases, buffer solutions, titration.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

36 hours of lectures/ self –study 71 hours

Target group:

Biology, Geology, Mechanical Engineering, Process Engineering, Environmental Engineering compulsory. Geography, optional.

Prerequisites and co-requisites:

No specific prerequisites

Recommended optional programme components:

This course has partly the same contents as the courses General and Inorganic Chemistry I and II (780114P and 780115P) or Introduction to Chemistry (780113P) (and the course Introduction to Physical Chemistry). If the student performs also the courses Inorganic Chemistry I and II (780114P and 780115P) or Introduction to Chemistry, this course will be cancelled in his/hers study register.

Recommended or required reading:

Petrucci, R.H., Harwood, W.S., and Herring, F.G.: General Chemistry: Principles and Modern Applications, Prentice Hall, 8th edition (2002) (Chapters 1-6, 10, 16-18) or a newer edition.

Assessment methods and criteria:

Final examination
Read more about assessment criteria at the University of Oulu webpage.

Grading:

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

Person responsible:

Lecturer Minna Tiainen

Working life cooperation:

No

Other information:

This course is only for students who have chemistry as a minor subject.

780112P: Introduction to Organic Chemistry, 4 op

Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Johanna Kärkkäinen
Opintokohteen kielet: Finnish
Leikkaavuudet:

ay780112P	Introduction to Organic Chemistry (OPEN UNI)	4.0 op
780103P	Introduction to Organic Chemistry	6.0 op
780103P2	Organic Chemistry I	6.0 op
780108P	Basic Course in Organic Chemistry	6.0 op

ECTS Credits:

4 credits/107 hours of work

Language of instruction:

Finnish. Book-examination in English as well.

Timing:

1 st autumn and 1 st spring

Learning outcomes:

Upon completion of the course, the student can identify functional groups and structures of organic compounds, nomenclature, properties and reactions, can describe fundamentals of organic chemistry and use its terminology.

Contents:

Functional groups and nomenclature of organic compounds, basic principles of stereochemistry, reactions with applications.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

32 hours of lectures and applications, 75 hours of self study

Target group:

Biology, Process Engineering, Environmental Engineering, compulsory.
Physical Sciences, Geology, Geograhpy, Mathematical Sciences, optional.

Prerequisites and co-requisites:

Upper secondary school chemistry

Recommended optional programme components:

This 4 credits course is a part of the course 780103P Intrduction to organic Chemistry 6 credits. Hence, students attend the lectures of 780103 P Introduction of Organic Chemistry 6 credits.
The student can make up this couse to the course 780103 P Intrduction to organic Chemistry 6 credits.

Recommended or required reading:

Hart, H., Hart, D.J. and Craine, L.E.: Organic Chemistry: A Short Course, 10 th or a newer edition, Houghton Mifflin Boston, 1999; Hart, H., Hart, D.J. and Craine, L.E.: Study Guide & Solutions Book, Organic Chemistry: A Short Course, 10th or a newer edition, Houghton Mifflin Boston, 1999.

Assessment methods and criteria:

Two intermediate examinations or one final examination
Read more about assessment criteria at the University of Oulu webpage.

Grading:

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

Person responsible:

Ph.D. Johanna Kärkkäinen

Working life cooperation:

No

Other information:

Students attend the lectures of 780103 P Introduction of Organic Chemistry 6 credits.

780122P: Introductory Laboratory Course in Chemistry, 3 op

Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

ECTS Credits:

3 credits/80 hours of work

Language of instruction:

Finnish

Timing:

1st autumn or spring

Learning outcomes:

After this course the student can apply laboratory safety instructions and act accordingly. He/she can communicate by using basic laboratory terminology and work in a group under the guidance. The student identifies basic laboratory tools and can use them properly. He/she can perform basic inorganic determinations: acid-base titrations, mass analysis or spectroscopic measurements and can apply them to analyze inorganic synthetic products, or use study thin layer chromatography to study purity of organic products. The student can write a report related to the performance and analysis of the synthesis.

Contents:

Laboratory safety, Bunsen burner, balances, volumetric measures, gravimetric determination, acid-base titration, pH, titration curves, acid-base indicators, buffer solutions, synthesis and analysis of an inorganic product, spectrophotometric determination, an organic synthesis, TLC. Written report.

Mode of delivery:

Supervised laboratory work

Learning activities and teaching methods:

Safety in laboratory 2 hours, 40 hours of laboratory work + demonstrations, 38 hours of self study

Target group:

Biochemistry, Biology, Chemistry, Process Engineering, Environmental engineering, compulsory. In the entity of 25 credits, compulsory. Physical Sciences, Geology, Mathematical Sciences, optional.

Prerequisites and co-requisites:

Basic Principles in Chemistry (780109P) or Introduction to Chemistry (780113P) passed, or participation in the courses General and Inorganic Chemistry I (780114P) and General and Inorganic Chemistry II (780115P).

Recommended optional programme components:

The course Basic Principles in Chemistry (780109P) or Introduction to Chemistry (780113P) passed, or Biochemistry, Chemistry and teacher education students of Mathematics and Physics: simultaneous participation in the courses General and Inorganic Chemistry I (780114P) and General and Inorganic Chemistry II (780115P).

Recommended or required reading:

Instruction Book (in Finnish): Kemian perustyöt

Assessment methods and criteria:

Final examination. Laboratory works and final examination has to be completed within next two terms. Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilizes verbal grading scale pass/fail.

Person responsible:

Prof. Marja Lajunen and teaching assistants

Working life cooperation:

No

Other information:

Attendance at the lecture of Safety at work is compulsory. Deadline of the written report is binding. Failure will lead to the renewal of the work.

477201A: Material and Energy Balances, 5 op

Voimassaolo: 01.08.2005 - 31.12.2019
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

477221A	Material and Energy Balances	5.0 op
470220A	Fundamentals of Chemical Process Engineering	5.0 op

ECTS Credits:

5 cr

Language of instruction:

Finnish.

Timing:

Periods 1-2.

Learning outcomes:

The student is able to formulate material and energy balances for a process by taking into account the restrictions set by reaction stoichiometry. The student knows how the created mathematical formulation can be exploited in process consideration.

Contents:

Formulation of material and energy balances by taking into account the effects of chemical reactions.

Mode of delivery:

Lectures and group exercises.

Learning activities and teaching methods:

Lectures 40h and Self-study 90h

Target group:

Bachelor students in DPEE

Prerequisites and co-requisites:

Basics from the course Introduction to Process Engineering.

Recommended optional programme components:

-

Recommended or required reading:

Reklaitis, G.V.: Introduction to Material and Energy Balances. John Wiley & Sons, 1983. ISBN 0-471-04131-9.

Assessment methods and criteria:

Continual assessment based on exams and group exercises.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Scale 1-5

Person responsible:

University Teacher Ilkka Malinen

Working life cooperation:

No

Other information:

-

477401A: Thermodynamic Equilibria, 5 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Eetu-Pekka Heikkinen
Opintokohteen kielet: Finnish
Leikkaavuudet:

470611A	Metallurgy Processes	7.0 op

ECTS Credits:

5 cr

Language of instruction:

Finnish

Timing:

Implementation in 2nd period.

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

Learning activities and teaching methods:

Lectures, software exercise as well as other exercises. Only in Finnish.

Target group:

Students of process and environmental engineering

Prerequisites and co-requisites:

'Kemian perusteet' and 'Material and Energy Balances' as prerequisities.

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:

Material will be distributed during lectures and exercises.

Assessment methods and criteria:

Students are required to make a portfolio consisting of a learning diary and exercices. Please note that the course is not organised for the English speaking students.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Failed, 1, 2, 3, 4 and 5.

Person responsible:

University teacher Eetu-Pekka Heikkinen

Working life cooperation:

No

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.

477301A: Momentum Transfer, 3 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Ainassaari, Kaisu Maritta, Tuomaala, Eero Juhani

Opintokohteen kielet: Finnish

Leikkaavuudet:

477052A	Fluid Mechanics	5.0 op
470619A	Fluid Mechanics	3.0 op

ECTS Credits:

3 cr

Language of instruction:

Finnish, can be completed in English as a book examination.

Timing:

Implementation in spring semester during 4 th period.

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. Macroscopic balances. Basic principles of computational fluid dynamics (CFD).

Mode of delivery:

Lectures including exercises.

Learning activities and teaching methods:

Lectures 20 h, exercises 15 h and homework 10 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:

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:

Bird, R.B., Stewart, W.E. & Lightfoot, E.N., Transport phenomena, John Wiley & Sons, 1976, 780 p. *Additional literature:* Jokilaakso, A., Virtaustekniikan, lämmönsiirron ja aineensiirron perusteet, 496, Otakustantamo, 1987, 194 p. Coulson, J.F. et al., Chemical engineering vol.1, 4th ed., Pergamon Press, 1990. 708 p. Shaw, C.T., Using computational fluid dynamics, Prentice Hall, 1992, 251 p.

Assessment methods and criteria:

Examination or continuous evaluation.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

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

Person responsible:

University teacher Eero Tuomaala

Working life cooperation:

No

Other information:

-

477302A: Heat Transfer, 3 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Tuomaala, Eero Juhani

Opintokohteen kielet: Finnish

Leikkaavuudet:

477322A	Heat and Mass Transfer	5.0 op
470620A	Heat Transfer	3.0 op

ECTS Credits:

3 cr

Language of instruction:

Finnish, can be completed in English as a book examination.

Timing:

Implementation in spring semester during 5 th period.

Learning outcomes:

After passing the course the student knows what happens when heat is transferred by conduction, convection and radiation. After the course the student can describe energy transfer with differential energy balances connected with momentum 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. 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 is able to divide the costs of the used energy in right proportion based on the processing stage.

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.

Mode of delivery:

Lectures including exercises.

Learning activities and teaching methods:

Lectures 20 h, exercises 15 h and homework 10 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:

Course 477301A Momentum Transfer is 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:

Bird, R, B., Stewart, W.E. & Lightfoot, E.N., Transport Phenomena, John Wiley & Sons, 1976, 780 p.; Linnhoff, B. et al.: A User Guide on Process Integration for the Efficient Use of Energy, The Institution of Chemical Engineers, 1987, 247 p.
Additional literature: Jokilaakso, A., Virtaustekniikan, lämmönsiirron ja aineensiirron perusteet, 496, Otakustantamo, 1987, 194 p. Coulson, J.F. et al., Chemical engineering vol.1, 4th ed., Pergamon Press, 1990. 708 p. Peters, M.S. &Timmerhaus, K.D., Plant design and economics for chemical engineers, 4th ed., McGraw-Hill, 1991, 910 p. Sussman, M.V., Availability (exergy) analysis, Mulliken House, 1985, 94 p.

Assessment methods and criteria:

Examination or continuous evaluation.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

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

Person responsible:

University teacher Eero Tuomaala

Working life cooperation:

No

Other information:

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477303A: Mass Transfer, 3 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Ainassaari, Kaisu Maritta, Tuomaala, Eero Juhani
Opintokohteen kielet: Finnish
Leikkaavuudet:

477322A	Heat and Mass Transfer	5.0 op
470621A	Mass Transfer	3.0 op

ECTS Credits:

3 cr

Language of instruction:

Finnish, can be completed in English as a book examination.

Timing:

Implementation in autumn semester during 1 st period.

Learning outcomes:

After the course the 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 theories of Fick and Maxwell-Stefan and to compare the models to each other. 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:

Diffusion. The laws of diffusion by Fick and Maxwell-Stefan.Mass transfer in simple systems. Differential mass balances. Models of mass transfer in turbulent systems. Interphase mass transfer. Absorption.Drying of solid.

Mode of delivery:

Lectures including exercises.

Learning activities and teaching methods:

Lectures 20 h, exercises 15 h and homework 10 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:

Courses 477301A Momentum Transfer and 477302A 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:

Bird, R,B., Stewart, W.E. & Lightfoot, E.N.: Transport Phenomena, John Wiley & Sons, 1976, 780 p.; King, C.J.: Separation Processes, McGraw-Hill, 1980, 850 p.; Wesselingh J.A. & Krishna R.: Mass Transfer, Ellis Horwood, 1990, 243 p.
Additional literature: Jokilaakso, A., Virtaustekniikan, lämmönsiirron ja aineensiirron perusteet, 496, Otakustantamo, 1987, 194 p.; Coulson, J.F. et. al.: Chemical Engineering vol.1, 4th ed., Pergamon Press, 1990. 708 p.; McCabe, W.L. et al.: Unit Operations of Chemical Engineering, 5th ed., McGraw-Hill, 1993, 1130 p.

Assessment methods and criteria:

Examination or continuous evaluation.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

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

Person responsible:

University teacher Kaisu Ainassaari

Working life cooperation:

No

Other information:

-

477202A: Reactor Analysis, 4 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Ahola, Juha Lennart
Opintokohteen kielet: Finnish
Leikkaavuudet:

477222A	Reactor Analysis	5.0 op
470221A	Reactor Analysis and Design I	5.0 op

ECTS Credits:

4 cr

Language of instruction:

Finnish

Timing:

Period 3.

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 36h and Self-study 70h

Target group:

Bachelor students in DPEE

Prerequisites and co-requisites:

Objectives of 477201A Material and Energy Balances and 477401A Thermodynamic Equilibrium

Recommended optional programme components:

-

Recommended or required reading:

Lecture handout. Levenspiel, O., Chemical Reaction Engineering. John Wiley & Sons, New York, 1972 (Chapters 1-8). Atkins, P.W.: Physical Chemistry, Oxford University Press, 2002. 7 th Ed. (Parts) ISBN 0-19-879285-9

Assessment methods and criteria:

Combination of examination and group exercises.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Scale 1-5

Person responsible:

University Lecturer Juha Ahola

Working life cooperation:

No

Other information:

-

477402A: Solid Inorganic Materials, 5 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Pekka Tanskanen
Opintokohteen kielet: Finnish
Leikkaavuudet:

470611A	Metallurgy Processes	7.0 op

ECTS Credits:

5 cr

Language of instruction:

Finnish

Timing:

Implementation in the 6th period.

Learning outcomes:

Students passing the cource can name the most important solid inorganic materials (metals and compounds) and their applications. Students can describe the significance of the materials for the society and tell about the refining chains and environmental impacts of the materials. Students can describe the structure and properties of solid materials and their interdependency and characterization methods. Students can compare and classify materials and tell the factors the classification is based on. Additionally, students can tell about the importance of the structural approach on the materials when estimating their performance in use or in reprocessing.

Contents:

Sources, usage, importance, refining and environmental impacts of inorganic solid materials (metals and compounds) used in modern society. Structure, properties and interdependency between the structure and properties and material characterization methods. Application examples: solid materials as raw materials and products in process industry (e.g. steel and concrete).

Mode of delivery:

Classroom education

Learning activities and teaching methods:

Lectures. Only in Finnish.

Target group:

Students of process engineering

Prerequisites and co-requisites:

No prerequisities.

Recommended optional programme components:

This course is an introduction to the advanced courses of metallurgy. Additionally, it gives a material-based perspective for the consideration of industrial processes. It is part of the streams that aim at skills needed in the phenomenon-based modelling and planning of industrial processes as well as holistic understanding of industrial processes.

Recommended or required reading:

Material will be distributed during lectures.

Assessment methods and criteria:

Written exam. Please note that the course is not organized for the English speaking students.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Failed, 1, 2, 3, 4 and 5.

Person responsible:

university teacher Pekka Tanskanen

Working life cooperation:

No

Other information:

-

477101A: Particle Technology, 3 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Ari Ämmälä
Opintokohteen kielet: Finnish
Leikkaavuudet:

477121A	Particle Technology	5.0 op
470101A	Mechanical Process Engineering I	5.0 op

ECTS Credits:

3 cr

Language of instruction:

Finnish

Timing:

Implementation in period 3.

Learning outcomes:

Upon completion of the course, a student should be able to identify the mainline mechanical processes enhancing the degree of upgrading, as well as recovery operations related to those mechanical main processes. The student is able to identify the equipments related to the mechanical processes and can explain their purpose of use and their operational principles.

Contents:

Granular material and sampling, particle size and particle size distribution, specific surface area, basics in grinding, crushing, sieving and mineral concentration, froth flotation, mineral concentration methods based on density difference, magnetic concentration and other concentration methods, granulation, separation from suspensions.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures and exercises.

Target group:

Bachelor students in process and environmental engineering

Prerequisites and co-requisites:

Introduction to Process Engineering 477011P

Recommended optional programme components:

-

Recommended or required reading:

Lecture materials and other materials that will be announced at the lectures.

Assessment methods and criteria:

Exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

0-5

Person responsible:

Education coordinator

Working life cooperation:

No

Other information:

Literature exam possible for foreign students.

477102A: Bulk Solids Handling, 4 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Ari Ämmälä
Opintokohteen kielet: Finnish
Leikkaavuudet:

477122A	Bulk Solids Handling	5.0 op
470103A	Mechanical Process Engineering III	5.0 op
470102A	Mechanical Process Engineering II	5.0 op

ECTS Credits:

4 cr

Language of instruction:

Finnish

Timing:

Implementation in period 4.

Learning outcomes:

Upon completion of the course, a student should be able to identify auxiliary mechanical unit processes as well as equipments and phenomena related to them. In addition, the student can explain application of unit processes and can describe their operational principles.

Contents:

Fluid mechanics, fluid transfer, mixing, properties affecting storage and transportation of granular material, storing of granular material, transportation of solid materials, mechanical conveyors, pneumatic and hydraulic transport, fluidization.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures and exercises.

Target group:

Bachelor students in process engineering

Prerequisites and co-requisites:

477101A Particle Technology

Recommended optional programme components:

-

Recommended or required reading:

Lecture materials and other materials that will be announced at the lectures.

Assessment methods and criteria:

Exam.
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:

Education coordinator

Working life cooperation:

No

Other information:

Literature exam possible for foreign students.

477501A: Process dynamics, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Leiviskä, Kauko Johannes
Opintokohteen kielet: Finnish
Leikkaavuudet:

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

ECTS Credits:

5 cr

Language of instruction:

Finnish/English

Timing:

Implementation in 3 rd period.

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, distillation columns and heat exchangers. Modelling of larger processes.

Learning activities and teaching methods:

Lectures during one period

Target group:

Bachelor's students in DPEE

Prerequisites and co-requisites:

Courses Material and Energy Balances, Heat Transfer, Mass Transfer and Control System Analysis recommended beforehand.

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.; Yang, W.J., Masubuchi, M.: Dynamic Process and System Control. Gorden and Breach Science Publishers, New York 1970. 448 s.

Assessment methods and criteria:

Home work and written/oral test.
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 Kauko Leiviskä

Working life cooperation:

No

Other information:

-

477502A: Process Control Engineering II, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Leiviskä, Kauko Johannes
Opintokohteen kielet: Finnish
Leikkaavuudet:

470432A	Process Control Engineering II	5.0 op

ECTS Credits:

5 cr

Language of instruction:

Finnish

Timing:

Implementation in 6 th period.

Learning outcomes:

After the course, the student knows different experimental design methods and their applicability for different problems. He can also design experiments for multivariable 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, Taguchi). Graphical and statistical analysis of experimental data. Correlation, regression and variance analysis. Dynamic data based modelling.

Mode of delivery:

Lectures and extensive exercise work.

Learning activities and teaching methods:

lectures during one period

Target group:

Bachelor's students in DPEE

Prerequisites and co-requisites:

Course Process Control Engineering I recommended beforehand.

Recommended optional programme components:

The course forms a basis to the advanced courses in the field of control engineering.

Recommended or required reading:

Lecture handout in the web. Additional literature: Diamond W.J.: Practical Experiment Designs. Lifetime Learning Publications. Belmont, California, 1981. 348 pp.

Assessment methods and criteria:

Examination. Possibility to take the course also according to the principle of continuous evaluation. 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 Kauko Leiviskä

Working life cooperation:

No

Other information:

-

A431121: Module Preparing for the Option, Module 1, 29 - 40 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Module Preparing for the Option
Laji: Study module
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Compulsory

555220P: Basic Course in Industrial Engineering and Management, 3 op

Opiskelumuoto: Basic Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Auvinen, Aila Irmeli

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

3,0 - 4,5 ECTS credits.

Language of instruction:

Finnish.

Timing:

Periods 1-4.

Learning outcomes:

The objective of the course is to familiarise a student to industrial activities, to operations of an enterprise as well as to the factors affecting the success of an enterprise. Upon completion the student should be able to describe IEM as a science and a profession, describe basic systemic models of an enterprise, describe basic concepts of microeconometrics, and calculate basic calculations of microeconometrics.

Contents:

Production and operations, systemic models of an organization, basic calculations of microeconometrics.

Mode of delivery:

Face-to-face learning.

Learning activities and teaching methods:

Lectures and exercises are held during the periods 1 - 3.

Target group:

-

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Applicable parts of the book Uusi-Rauva, E., Haverila, M., Kouri, I. & Miettinen, A. 2005. Teollisuustalous. 5. p. Ylöjärvi. Infacs Johtamistekniikka. Some other material in Business Economics is defined by a student and the person responsible for the course.

Assessment methods and criteria:

Exam and the homework.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

1-5.

Person responsible:

Lecturer Aila Auvinen

Working life cooperation:

No.

Other information:

The lectures and weekly exercises are held in Finnish. The English examination is based only on written material **.** Please, contact the person responsible for the course and ask the study material and the exam for you.

555221P: Introduction to Production, 2 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Basic Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Auvinen, Aila Irmeli

Opintokohteen kielet: Finnish

Leikkaavuudet:

555225P Basics of industrial engineering and management 5.0 op

ECTS Credits:

2 ECTS credits.

Language of instruction:

Finnish

Timing:

Period 4.

Learning outcomes:

The objective of the course is to familiarise a student to the concepts and theories that aim to explain and predict the design and operation of production systems. After the course a student should be able to explain the basic concepts of the production and view the decisions related to production systems in different situations, explain the stages of the investment process, solve some basic calculations, make design tasks and evaluate them, and describe the economic and administrative instruments of environmental law related to an enterprise.

Contents:

Operations strategy, service operations, process design and improvement, process choices and production layout, capacity management, facility location.

Mode of delivery:

Face-to-face learning.

Learning activities and teaching methods:

Lectures and exercises.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

555220P Basic course in industrial engineering and management, 555280P Basic course of project management.

Recommended optional programme components:

-

Recommended or required reading:

Krajewski, L. J., Ritzman L. P. & Malhotra M.K. 2007. Operations management: processes and value chains. 8. p. Upper Saddle River (NJ), Pearson Prentice Hall. Chapters: 1. Operations as a Competitive Weapon, 2. Operations Strategy, 4. Process Strategy, 5. Process Analysis, 7. Constraint Management, 8. Process Layout, 11. Location, and Supplements A: Decision Making and J: Financial Analysis.

Assessment methods and criteria:

Exam and the homework.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

1-5.

Person responsible:

Lecturer Aila Auvinen

Working life cooperation:

No.

Other information:

The lectures and weekly exercises are held in Finnish. The English exam is based only on the written material mentioned in study materials. Please, contact the person responsible for the course.

555260P: Basic Course in Occupational Safety and Wellbeing at Work, 3 op

Opiskelumuoto: Basic Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Henri Jounila, Seppo Väyrynen

Opintokohteen kielet: Finnish

Leikkaavuudet:

555265P Occupational Safety and Health Management 5.0 op

ay555260P Basic Course in Occupational Safety and Wellbeing at Work (OPEN UNI) 3.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

3 ECTS credits.

Language of instruction:

Finnish.

Timing:

The course unit is held in the spring semester, during Periods 5 and 6.

Learning outcomes:

After the course the student is capable of explaining basic terms of work envi-ronment. He is able to assess the importance of occupational safety, health and well-being at work. In addition, he is able to assess the significance of occupational safety in the improving of productivity and quality.

Contents:

Students will acquire knowledge and practical skills which they will be able to utilize and integrate on ordinary engineering practice. Work accidents and occupational diseases, safety promo-tion, occupational health, ergonomics development, and organising principles in modern production systems and in other work environments.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 20 h. The exercises are completed as group work.

Target group:

-

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Työsuojelun perusteet. Työterveyslaitos 2009, ISBN: 978-951-802-916-1. Other literature reported at the beginning of the course. As an exercise material: Pienyrityksen työympäristö tuloksen tekijänä 2012, Työsuojeluoppaita ja -ohjeita 5, Työsuojeluhallinto, ISBN 978-952-479-049-9.

Assessment methods and criteria:

Exam and exercises.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

1-5

Person responsible:

Henri Jounila

Working life cooperation:

No

Other information:

-

555280P: Basic Course of Project Management, 2 op

Opiskelumuoto: Basic Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Jaakko Kujala
Opintokohteen kielet: Finnish
Leikkaavuudet:

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

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

2 ECTS credits.

Language of instruction:

Finnish

Timing:

Periods 1-3.

Learning outcomes:

Upon completion the student can explain the essential concepts related to project management. He/she can present the main features of a project plan and can use different methods of partitioning a project. The student can also schedule a project and estimate its costs. The student can explain the terms related to Earned value method and can apply the method on simple tasks. Upon completion the student recognizes the essential tasks of project risk management.

Contents:

Defining project management, project planning, organising and scope management, schedule management, cost management, earned value calculation and project risk management.

Mode of delivery:

Face-to-face learning.

Learning activities and teaching methods:

Lectures, weekly assignments and exercise book. The final grade is derived from the course exam.

Target group:

-

Prerequisites and co-requisites:

None.

Recommended optional programme components:

-

Recommended or required reading:

Lecture material, exercise book. Artto, Martinsuo & Kujala 2006. Projektiliiketoiminta. WSOY, ISBN: 951-0-31482-X (applicable sections), available at http://pbgroup.aalto.fi/en/the_book_and_the_glossary/.

Assessment methods and criteria:

Week assignments and final exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

1-5

Person responsible:

Professor Jaakko Kujala.

Working life cooperation:

No

477021A: Laboratory Exercises of Process Engineering, 4 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

480320A	Laboratory Exercises of Process Engineering	3.5 op
470223A	Laboratory Experiments of Chemical Process Engineering	3.5 op
470325A	Laboratory Exercises of Mass and Heattransfer	3.0 op
470440A	Laboratory Exercises in Systems Engineering	2.5 op
470442A	Process Control Engineering Laboratory Exercises	3.0 op

ECTS Credits:

4 cr

Language of instruction:

Finnish

Timing:

Periods 1-6

Learning outcomes:

The student knows how to calculate the overall heat-transfer coefficient for co- and countercurrent heat exchangers with the aid of temperatures and flows. The student identifies the main mechanical unit processes and is able to explain their operation principle. Student knows how to implement tools to estimate reaction kinetic parameters based on experimental batch reactor data. The student is familiar with the stages of reactor design in early phases of process design. The student demonstrates in the laboratory exercises that he/she can use a programmable logic and is able to tune the PID controller experimental facilities.

Contents:

The student chooses four laboratory exercises from the offered ones related to process and automation engineering.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

The laboratory work will be done separately for the time allocated for them and producing a report.

Target group:

B.Sc. students in process and environmental engineering

Prerequisites and co-requisites:

477011P Introduction to process and environmental engineering I, 4770xxP Introduction to process and environmental engineering II, 477302A Heat transfer and 477202A Reactor analysis

Recommended optional programme components:

The course 477602A Control System Analysis should be completed simultaneously

Recommended or required reading:

To be announced later.

Assessment methods and criteria:

Laboratory work and the report.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 1-5 or fail

Person responsible:

University teachers

Working life cooperation:

No

Other information:

-

477304A: Separation Processes, 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Muurinen, Esa Ilmari, Ainassaari, Kaisu Maritta

Opintokohteen kielet: Finnish

Leikkaavuudet:

470323A Separation Processes 5.0 op

ECTS Credits:

5 cr

Language of instruction:

Finnish, can be completed in English as a book examination.

Timing:

Implementation in autumn semester during 1 st and 2 nd periods.

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.

Mode of delivery:

Lectures including exercises.

Learning activities and teaching methods:

Lectures 40 h, exercises 20 h and homework 16 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:

Courses 477301A Momentum Transfer, 477302A Heat Transfer and 477303A Mass 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:

King, C.J.: Separation Processes, McGraw-Hill, 1980, 850 p.; Noble, R.D. & Terry, P.A.: Principles of Chemical Separations with Environmental Applications. Cambridge 2004, Cambridge University Press, 321 p.

Additional literature: Henley, E.S. &Seader, J.D.: Equilibrium Stage Separation Operations in Chemical Engineering, John Wiley & Sons, 1981, 742 p.; McCabe, W.L. et al.: Unit Operations of Chemical Engineering, 5th ed., McGraw-Hill, 1993, 1130 p.; Rousseau, R.W.: Handbook of Separation Process Technology, John Wiley & Sons, 1987, 1010 p.

Assessment methods and criteria:

Homework assignments affect the course grade. Examination.
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 Riitta Keiski

Working life cooperation:

No

Other information:

-

477103A: Bioproduct Technology, 3 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: English
Leikkaavuudet:

488052A	Introduction to Bioproduct and Bioprocess engineering	5.0 op
470308S	Pulp and Paper Technology	2.5 op

ECTS Credits:

3 cr

Language of instruction:

English

Timing:

Implementation in period 5.

Learning outcomes:

Upon completion of the course, a student should be able to identify key renewable natural resources and their sustainable and economical processing as well as end use.

Contents:

Lignocellulosic raw materials and their properties, value chains of biomass processing, recycling of biomaterials, bioenergy, and economical and environmental aspects.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures.

Target group:

Students interested in bioeconomy

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Book series: Fapet Oy. Papermaking Science and Technology, 20 books; Smook, G. A.: Handbook for Pulp and Paper Technologists. Vancouver 1992, 419 s. Lecture materials and other materials that will be announced at the lectures.

Assessment methods and criteria:

Exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

0-5

Person responsible:

Education coordinator

Working life cooperation:

No

Other information:

-

477203A: Process Design, 5 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Jani Kangas
Opintokohteen kielet: English
Leikkaavuudet:

480310A	Fundamentals of Process Design	5.0 op

ECTS Credits:

5 cr

Language of instruction:

English

Timing:

Periods 4-5.

Learning outcomes:

By completing the course the student is able to identify the activities of process design and the know-how needed at different design stages. The student can utilise process synthesis and analysis tools for creating a preliminary process concept and point out the techno-economical performance based on holistic criteria.

Contents:

Acting in process design projects, safety and environmentally conscious process design. Design tasks from conceptual design to plant design, especially the methodology for basic and plant design.

Mode of delivery:

Lectures and design group exercises.

Learning activities and teaching methods:

Lectures 30h, group work 50h and self-study 50h

Target group:

Bachelor students in DPEE

Prerequisites and co-requisites:

Objectives of 477202A Reactor analysis, 477304A Separation processes and 477012 Introduction to Automation Engineering

Recommended optional programme components:

-

Recommended or required reading:

Lecture handout, Seider, W.D., Seider, J.D. and Lewin, D.R. Product and process design principles: Synthesis, analysis and evaluation. John Wiley & Sons, 2004. (Parts) ISBN 0-471-21663-1

Assessment methods and criteria:

Combination of examination and design group exercises.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Scale 1-5

Person responsible:

University Teacher Jani Kangas

Working life cooperation:

-

Other information:

-

488309A: Biocatalysis, 5 op

Voimassaolo: 01.08.2013 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

488212A	Fundamentals of catalysis	5.0 op
488308A	Enzyme Technology	2.0 op
488301A	Microbiology	3.0 op

ECTS Credits:

5 cr

Language of instruction:

Finnish

Timing:

The course is held in autumn semester during periods II and III. It is recommended to complete the course in the 2 th year.

Learning outcomes:

After completing this course, the student will be able to define what biocatalysts are. Student is able to describe in which way different microbes and enzymes can be applied as biocatalysts and can give examples how biocatalysts are applied. The student will be able to evaluate the cultivation and growth of microbes and the use of them in the production of different products. 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. Student will be able to judge how microbes and enzymes could be applied in industry.

Contents:

Microbes and enzymes as biocatalysts and the use of them in industry. The structural and functional characteristics, metabolism, products from metabolism, physiology, and growth of prokaryotic and eukaryotic cells from industrial point of view. The structure and function of enzymes, enzymatic reactions and kinetics.

Mode of delivery:

Blended teaching.

Learning activities and teaching methods:

Lectures 40 h/ group work 40 h/web-based teaching 10h/ self-study 40 h.

Target group:

Bachelor students for environmental engineering.

Prerequisites and co-requisites:

Course 477011P Introduction to process and environmental engineering I or respective knowledge of microbiology and biotechnology.

Recommended optional programme components:

-

Recommended or required reading:

Lecture hand out; Madigan MT, Martinko JM & 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;other material announced in the lectures.

Assessment methods and criteria:

Lectures, intermediate exams (välikokeet) or final examination and group work. Grade will be composed of group work and intermediate exams (välikokeet) or final examination.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

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

Person responsible:

University teacher Johanna Panula-Perälä

Working life cooperation:

No

Other information:

-

488302A: Basics of Biotechnology, 5 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Johanna Panula-Perälä
Opintokohteen kielet: English
Leikkaavuudet:

488052A	Introduction to Bioproduct and Bioprocess engineering	5.0 op
480430A	Bioprocesses I	5.0 op

ECTS Credits:

5 cr

Language of instruction:

English

Timing:

The course is held in spring semester during periods IV and V. It is recommended to complete the course in the 3 rd year.

Learning outcomes:

After completing this course, the student will be able to explain how the modern biotechnology can be applied in the food, pharma- and material industries, in the mining industry and environmental biotechnology, for example, in the production of alcoholic beverages and biofuels, antibiotics and other drugs, in metal manufacturing, and in biological degradation.

Contents:

Industrial biotechnology. Food biotechnology: Production of beer and alcoholic beverages; Biotechnology in dairy industry. Biotechnology in the mining and materials industries.

Biorefineries. Biotechnology in forest industry. Biopolymer engineering. Environmental Biotechnology: Biodegradation; Bioremediation. Pharmaceutical biotechnology: Production of antibiotics and therapeutic proteins.

Mode of delivery:

Blended teaching.

Learning activities and teaching methods:

Lectures 32 h/ group work and seminar presentation 50 h/ self-study 50 h.

Target group:

Bachelor students in process engineering and environmental engineering, students in M.Sc. Programme in Green Chemistry and Bioproduction, and in Master's degree programme in Biomass, Technology and Management.

Prerequisites and co-requisites:

Courses 488301A Microbiology and 488308S Enzyme technology for students started 2011, or respective knowledge of microbiology and biocatalysis.

Recommended optional programme components:

-

Recommended or required reading:

Will be announced at the lectures. Supplementary material: Aittomäki E ym.: BioProsessitekniikka. WSOY 2002. 951-26995-6; Salkinoja-Salonen M (toim.): Mikrobiologian perusteita. Helsingin yliopisto, 2002. 951-45-9502-5.

Assessment methods and criteria:

Lectures, intermediate exams and/or final exam, group work and seminar. Grade will be composed of lecture exams and/or final exam, group work and seminar.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

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

Person responsible:

University teacher Johanna Panula-Perälä

Working life cooperation:

No

477001A: Practical Training, 3 op

Opiskelumuoto: Intermediate Studies

Laji: Practical training

Arvostelu: 1 - 5, pass, fail

Opettajat: Saara Luhtaanmäki

Opintokohteen kielet: Finnish

Leikkaavuudet:

477004A	Practical Training	5.0 op
470065A	Industrial Training Period (practice)	7.0 op

ECTS Credits:

3 cr

Language of instruction:

Finnish or English

Timing:

Student usually works in summer time.

Learning outcomes:

Objective: To give an overview of the industrial area where the student may possibly work after graduation. Practical training nurtures theoretical study. In addition the training should give the student a general idea about the company and its technical and organizational operations, financial management and

supervision. Student training positions often place students in employee-type positions so that the student becomes familiar with practical work, work safety, as well as with the social nature of the working environment. Students will land the jobs themselves.
Learning outcomes: During the practical training the student is exposed to his/her working environment from the point of view of his/her studies and becomes acquainted with one of a possible future job. The student can identify the problems associated with the working environment and can propose improvements to them. The student will experience points of contact between working life and studies.

Contents:

Suitable areas for practical training are, for example, the chemical industry, the pulp and paper industry, the metallurgical and mining industry, the biotechnological and food industry, and partly the electronics and automation industry.

Mode of delivery:

Working as employee

Learning activities and teaching methods:

-

Target group:

Bachelor’s students in DPEE

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Student has to show original references and leave the application and report to student advisor. In reference must be training time period and duties.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Verbal scale Passed/Failed

Person responsible:

Student advisor Saara Luhtaanmäki

Working life cooperation:

Yes.

A431122: Module Preparing for the Option, Module 2, 20,5 - 21,5 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Module Preparing for the Option
Laji: Study module
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Compulsory

477033A: Programming in Matlab, 2,5 op

Voimassaolo: 01.01.2009 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail

Opettajat: Juha Pentti Jaako

Opintokohteen kielet: Finnish

Leikkaavuudet:

488051A AutoCAD and Matlab in Process and Environmental Engineering 5.0 op

ECTS Credits:

2,5 cr

Language of instruction:

Finnish

Timing:

Course unit is arranged twice a year: autumn semester (1st period) and spring semester (5th period). Recommended for second year B.Sc. students.

Learning outcomes:

Student can use Matlab in solving simple computational problems.

Contents:

Matlab as a computational tool, Graphics in Matlab, Programming in Matlab, Solution of computational problems in Matlab, Matlab debugging

Mode of delivery:

Tuition is implemented as face-to-face teaching and blended teaching (web-based teaching + face-to-face teaching).

Learning activities and teaching methods:

The amount of guided teaching is 20 hrs and for self-study there are 46.7 hrs allocated.
Contact teaching includes, depending on situation, lectures, group work and tutored group work. During self-study time student does independent work or group work.

Target group:

B.Sc. students in process and environmental engineering programmes.

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Heath, M.T. (2002) Scientific computing – An introductory survey. 2nd edition. McGraw-Hill. ISBN 007-124489-1.; Kiusalaas, J. (2005) Numerical methods in engineering with Matlab. Cambridge University Press. ISBN 978-0-511-12811-0.;
Matlab tutorials.

Assessment methods and criteria:

This course unit uses continuous assessment. There are 4 home work. Deadlines are observed. The assessment of the course is based on the learning outcomes of the course.
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:

D.Sc. Juha Jaako, lecturer

Working life cooperation:

No

Other information:

-

477032A: AutoCAD in Process and Environmental Engineering, 2 op

Voimassaolo: 01.09.2008 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Pekka Rossi

Opintokohteen kielet: Finnish

Leikkaavuudet:

488051A AutoCAD and Matlab in Process and Environmental Engineering 5.0 op

ECTS Credits:

2 cr

Language of instruction:

Finnish

Timing:

The course unit is held in the autumn semester, during periods 2-3

Learning outcomes:

Upon completion of the course, the student will have readiness to use AutoCAD-program in different planning assignments of process and environmental engineering.

Contents:

Properties of AutoCAD program, planning exercises (e.g. process flow chart, map planning, instrumentation layout).

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Computer class lectures (36 h), exercises (36 h).

Target group:

Students in bachelor program of environmental engineering

Prerequisites and co-requisites:

No

Recommended optional programme components:

-

Recommended or required reading:

Lecture notes.

Assessment methods and criteria:

Continuous evaluation of exercises.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Pass/fail.

Person responsible:

Researcher Pekka Rossi

Working life cooperation:

No

Other information:

-

031044A: Mathematical Methods, 4 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Mathematics Division

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Kemppainen
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

477601A: Process Automation Systems, 4 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Hiltunen, Jukka Antero, Harri Aaltonen
Opintokohteen kielet: Finnish
Leikkaavuudet:

477051A	Automation Engineering	5.0 op
470445S	Digital Process Automation	4.0 op

ECTS Credits:

4 cr

Language of instruction:

Finnish

Timing:

Period 1

Learning outcomes:

Students learn how to use automation systems and PLCs in design, implementation and commissioning projects. Students can configure and program the basic automation functions in DCSs and PLCs.

Contents:

The operational and structural descriptions and concepts of process automation, automation commissioning projects, configuration tools for automation functions, logic programming, telecommunication technology in automation, field buses, examples of commercial DCSs, PLCs and field bus systems.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

lectures, demonstrations, configuration and logic programming exercises, excursion to a neighbouring industrial plant

Target group:

B.Sc. students in process and environmental engineering

Prerequisites and co-requisites:

477011P Introduction to process and environmental engineering I and 4770xxP Introduction to process and environmental engineering II are recommended

Recommended optional programme components:

-

Recommended or required reading:

lecture notes and handouts, manuals/handbooks

Assessment methods and criteria:

Learning diary or examination.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

numerical grading scale 1-5 or fail

Person responsible:

Lecturer Jukka Hiltunen and Ph.D. student Harri Aaltonen

Working life cooperation:

No

Other information:

-

477602A: Control System Analysis, 4 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Seppo Honkanen

Opintokohteen kielet: Finnish

Leikkaavuudet:

477621A	Control System Analysis	5.0 op
470460A	Controls and Systems Engineering Fundamentals	5.0 op

ECTS Credits:

4 cr

Language of instruction:

Finnish

Timing:

Periods 2 and 3

Learning outcomes:

After completing the course the student can describe the process dynamics of mathematical and graphical methods. The student can independently: form linear process models, analyse linear system stability, Bode diagrams, Routh’s stability criterion and the Jury's test, and evaluate the behaviour of processes in time and frequency range specifications through.

Contents:

Introduction to Matlab. Laplace- transforms. Transfer functions and block diagrams. Dynamical systems. Time and frequency analysis. System stability.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures and exercises

Target group:

B.Sc. students in process and environmental engineering

Prerequisites and co-requisites:

The course 4770xxP Introduction to automation engineering recommended beforehand

Recommended optional programme components:

-

Recommended or required reading:

Dorf, R. (2010) Modern Control System. 12th ed. Prentice-Hall. 1104 pp. Additional literature:Ogata, K. (2002) Modern Control Engineering. 4th ed. Prentice-Hall. 964 pp., DiStefano, J. (1990) Feedback and Control Systems. 2nd ed. Prentice-Hall. 512 pp.; Ylen; J-P. (1994) Säätötekniikan harjoitustehtäviä. Hakapaino Oy. 252 pp.

Assessment methods and criteria:

Exam and in addition extra points from homework’s
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 1.5 or fail

Person responsible:

Lecturer Jukka Hiltunen and University teacher Seppo Honkanen

Working life cooperation:

No

Other information:

-

477603A: Control System Design, 4 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Seppo Honkanen

Opintokohteen kielet: Finnish

Leikkaavuudet:

477622A	Control System Design	5.0 op
470461A	Fundamentals of Control and Systems Engineering II	5.0 op

ECTS Credits:

4 cr

Language of instruction:

Finnish

Timing:

Periods 4 and 5

Learning outcomes:

After completing the course the students can apply mathematical and graphical methods to the dynamics of process characterisation and control design. The period of study completed, the student can form PID controllers for the process, and tune them and evaluate the closed-loop requirements.

Contents:

Laplace-level vs, time level, Poles of the system, Closed loop and its design specifications, PID control and tuning, Matlab control designer tool, control design in frequency domain.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures and exercises

Target group:

B.Sc. students in process and environmental engineering

Prerequisites and co-requisites:

The courses 4770xxP Introduction to process and environmental engineering II and 477602A Control system analysis recommended beforehand

Recommended optional programme components:

-

Recommended or required reading:

Lecture and exercises handouts, Åström, K & Murray, R. (2009) Feedback Systems, An Introduction for Scientists and Engineers. Princeton University Press, New Jersey, 396 s. Additional literature: Dorf, R (2010) Modern Control Systems. Prentice-Hall, New York, 1104 s., DiStefano, J (1990) Schaum's Outline of Feedback and Control Systems. 2nd ed, McGraw-Hill, 512 s. ja Ylen, J-P (1994) Säätötekniikan harjoitustehtäviä. Hakapaino Oy, 252 s.

Assessment methods and criteria:

Exam
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 1.5 or fail

Person responsible:

Professor Enso Ikonen and university teacher Seppo Honkanen

Working life cooperation:

No

Other information:

-

A431146: Supplementary Module/Bachelor's Degree, 10 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Supplementary Module / Bachelor's Degree
Laji: Study module
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

E

030005P: Information Skills, 1 op

Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Faculty of Technology
Arvostelu: 1 - 5, pass, fail
Opettajat: Sassali, Jani Henrik, Koivuniemi, Mirja-Liisa
Opintokohteen kielet: Finnish
Leikkaavuudet:

030004P Introduction to Information Retrieval 0.0 op

ECTS Credits:

1 ECTS credit

Language of instruction:

Finnish

Timing:

2nd or 3rd year

Learning outcomes:

Students know the different phases of information retrieval process and basic techniques of scientific information retrieval. They will find the most important reference databases of their discipline and know how to evaluate information sources and retrieval results.

Contents:

Retrieval of scientific information, the retrieval process, key databases of the discipline, and evaluation of information retrieval and information sources.

Mode of delivery:

Blended teaching: classroom training, web-based learning material and exercises in Optima environment, a final assignment on a topic of the student’s own choice

Learning activities and teaching methods:

Training sessions 8h, group working 7h, self-study 12h

Target group:

Compulsory for all students of the Faculty of Technology. In the Faculty of Science the course is compulsory for students of biology, physics, geosciences, chemistry, geography and information processing science. The course is optional for students of biochemistry and mathematics.

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Web learning material https://wiki.oulu.fi/display/030005P.

Assessment methods and criteria:

Passing the course requires participation in the training sessions and successful completion of the course assignments.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

pass/fail

Person responsible:

Science and Technology Library Tellus, tellustieto (at) oulu.fi

Working life cooperation:

-

Other information:

-

477000P: Planning of Studies and Career, 1 op

Voimassaolo: 01.08.2013 -
Opiskelumuoto: Basic Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Saara Luhtaanmäki
Opintokohteen kielet: Finnish
Leikkaavuudet:

030001P	Orientation Course for New Students	1.0 op

ECTS Credits:

1 cr

Language of instruction:

Finnish

Timing:

The course unit is held in the autumn semester, during periods I, II and III.

Learning outcomes:

The aim of the course is to introduce new students to the university, academic studies, the department and the studies of his/her degree programme in the faculty of Technlogy.

Contents:

Issues related to the beginning of the studies. Goals, structure and contents of the studies in the Faculty of Technology. Preparing a personal study plan. Study technique and the library.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Tutorials, information days organized by the faculty and by the degree programmes, independent studying, total 20 h.

Target group:

All first year students in DPEE

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Study guide.

Assessment methods and criteria:

Participation to the tutorials and information sessions and doing the personal study plan.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Verbal scale Passed/Failed

Person responsible:

Student advisor Saara Luhtaanmäki

Working life cooperation:

No.

Other information:

-

901008P: Second Official Language (Swedish), 2 op

Voimassaolo: 01.08.1995 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Language Centre

Opintokohteen kielet: Swedish

Leikkaavuudet:

ay901008P	Second Official Language (Swedish) (OPEN UNI)	2.0 op

Proficiency level:

B1/B2/C1 (Common European Framework of Reference)

Status:

This course is compulsory to all students except those who have at least 60 ECTS credits of Swedish studies in their degrees. The language proficiency provided by the course unit is equivalent to the language proficiency required of a state official with an academic degree working in a bilingual municipality area (Act 424/03 and Decree 481/03).
According to the requirements of the law, the student must be able to use Swedish both orally and in writing in various professional situations. Achieving this kind of proficiency during a course unit that lasts for only one semester requires that the student has already achieved the necessary starting proficiency level prior to taking the course.

Required proficiency level:

The required starting proficiency level for students of all faculties is a grade of 7 or higher from the Swedish studies at secondary school (B-syllabus) or equivalent knowledge AND a passing grade from the proficiency test held at the beginning of the course unit. Based on this proficiency test the students are directed to brush up on their language skills if it is deemed necessary; mastering basic vocabulary and grammar is a prerequisite to achieving the necessary language proficiency for the various communication situations one faces in professional life.

If a student has not completed Swedish studies (B-language) at secondary school with a grade of 7 or higher, or his/her language skills are otherwise lacking, he/she must achieve the required proficiency level BEFORE taking this compulsory Swedish course.

ECTS Credits:

2 ECTS credits

Language of instruction:

Swedish

Timing:

Students of Architecture: autumn semester of the first year of studies.
Students of Electrical Engineering and Computer Science and Engineering: autumn or spring semester of the first year of studies.
Students of Industrial Engineering and Management and Environmental Engineering: autumn semester of the 2nd year of studies
Students of Process Engineering and Mechanical Engineering: autumn or spring semester of the third year of studies.

Learning outcomes:

Upon completion of the course unit the student should be able to read and understand texts from his/her academic field and make conclusions based on them. The student should be able to write typical professional emails and short reports. He/she should be able to carry himself/herself according to Swedish etiquette when acting as host or guest. The student should also be able to discuss current events and special field-specific matters, use the vocabulary of education and plan and give short oral presentations relating to his/her own field.

Contents:

Communicative oral and written exercises, which aim to develop the student's Swedish proficiency in areas relevant to his/her academic field and future professional tasks. The student practises oral presentation and pronunciation. Situational exercises done individually and in pairs and groups. Discussions in small groups. Current texts about the student's special field. Written exercises relating to the student's professional field. Practising presentation skills.

Mode of delivery:

Contact teaching

Learning activities and teaching methods:

1 x 90 minutes of contact teaching per week and self-directed study, 52 hours per course.

Target group:

See Timing

Prerequisites and co-requisites:

See Required Proficiency Level

Recommended optional programme components:

-

Recommended or required reading:

Study material subject to a charge will be provided by the teacher.

Assessment methods and criteria:

The course unit focuses on improving both oral and written language skills and requires active attendance and participation in exercises, which also require preparation time. 100% attendance is required. The course unit tests both oral and written language skills.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Oral and written language proficiencies are tested separately and assessed using the so called KORU-criteria (publication of HAMK University of Applied Sciences, 2006). Separate grades will be awarded for the successful completions of both oral and written portions of the course unit: the possible passing grades are **satisfactory skills and good skills** (see language decree 481/03). The grades are based on continuous assessment and testing.

Person responsible:

See contact teachers on the Language and Communication home page www.oulu.fi/kielikoulutus

Working life cooperation:

-

Other information:

Students sign up for teaching in WebOodi. A student can only sign up for one teaching group. When signing up , it is imperative that the student fills in his/her university email address (paju.oulu.fi), major subject and Swedish grades attained during secondary education in the Further Information field. Information in sign-up periods and course unit timetables can be found in WebOodi.

900009P: Second Official Language (Finnish), 2 op

Voimassaolo: 01.08.1995 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Language Centre

Opintokohteen kielet: Finnish

Proficiency level:

B1/B2/C2

Status:

This course is compulsory to students who received their schooling in Swedish.
The language proficiency provided by the course unit is equivalent to the language proficiency required of a state official with an academic degree working in a bilingual municipality area (Act 424/03 and Decree 481 /03).

Required proficiency level:

Successful completion of the A-syllabus in Finnish (A-finska) during secondary education or equivalent knowledge.

ECTS Credits:

3 credits

Language of instruction:

-

Timing:

Second year of studies

Learning outcomes:

Upon completion of the course the student should have attained the required proficiency level in Finnish to be able to function in his/her studies and professional work tasks. The student should be able to manage in various oral communication situations, read literature from his/her academic field and write fluent texts about his/her special field. The student should also be able to understand standard spoken Finnish as well as Finnish of his/her own special field.
The language proficiency provided by the course unit is equivalent to the language proficiency required of a state official with an academic degree working in a bilingual municipality area (Act 424/03 and Decree 481 /03).

Contents:

Taking the course exam and participating in the teaching, if necessary.

Mode of delivery:

Contact teaching

Learning activities and teaching methods:

The course exam consists of a written section (4 hours) and an oral section (1 hour). 60 hours of contact teaching is arranged for students who fail the exam. Active and regular participation in the teaching is required.

Target group:

Students in the Faculty of Technology who received their schooling in Swedish.

Prerequisites and co-requisites:

Successful completion of the A-syllabus in Finnish (A-finska) during secondary education or equivalent knowledge.

Recommended optional programme components:

-

Recommended or required reading:

To be agreed on.

Assessment methods and criteria:

This course is usually completed by taking the course exam held by the Language Centre. The exam tests the student's Finnish language skills: written and oral text production, reading and listening comprehension and special field-specific language skills. Students who fail the exam may attend Finnish language teaching, after which they must retake and pass the exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Separate grades are given for written and oral language skills: the possible passing grades are satisfactory skills and good skills. Satisfactory skills equal B1 proficiency and good skills equal B2 proficiency or higher in the Common European Framework of Reference for Languages (CEFR).

Person responsible:

Anne Koskela

Working life cooperation:

-

Other information:

The written exam is held during the autumn semester. Students sign up for the exam in WebOodi. The date of the oral exam is agreed upon separately. Students must bring a copy of their matriculation examination certificate with them when they come to the exam. If they have completed the Central Government's language proficiency exam, they must bring a copy of that certificate with them as well.

You can choose also another language than English.

902011P: Technical English 3, 6 op

Voimassaolo: 01.08.1995 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Language Centre
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: English

Proficiency level:

CEFR B2 - C1

Status:

This course is compulsory for the students who have chosen English as their foreign language. (See the foreign language requirements for your own degree programme.)

Required proficiency level:

English must have been the A1 or A2 language at school or equivalent English skills acquired otherwise. If you need to take English, but lack this background, please get in touch with the Languages and Communication contact teacher for your department to discuss individual solutions.

ECTS Credits:

6 ECTS credits (The workload is 160 hours.)
STUDENTS OF ENGINEERING: The course consists of 3 x 2-ECTS modules.
STUDENTS OF ARCHITECTURE: The course consists of 2 x 3-ECTS modules.
Students with the matriculation exam grade *Laudatur* or *Eximia cum laude approbatur* will be exempted from part of the course (2 ECTS credits).

Language of instruction:

English

Timing:

STUDENTS OF ENGINEERING:
PYO, KO, TuTa: *1st & 2nd* years of studies, beginning 1st year autumn.
SO & CSE: 2nd & 3rd years of studies, beginning 2nd year autumn.
STUDENTS OF ARCHITECTURE:
1st & 2nd years of studies, beginning 1st year spring and continuing 2nd year autumn.

Learning outcomes:

By the end of the course, you will be able to

- demonstrate efficient strategies and methods for developing and maintaining your English proficiency
- communicate using the core vocabulary required for professional language use in your field
- apply language skills, intercultural awareness and presentation techniques necessary for working in a multicultural environment
- use language, culture and communication skills at a B2-C1 CEFR level in accordance with your own professional needs.

Contents:

In this course, you will focus on developing oral and written English language skills which enable you to follow developments in your own professional field and manage successfully in an international, intercultural working environment.

STUDENTS OF ENGINEERING:
The course consists of three modules:

1. first, **Professional English for Technology** (PET, 2 ECTS credits),
2. then **two modules** (2 ECTS credits each) from a free-choice module menu, in which each module has its own content. These modules allow you to develop further skills in specific core areas. Read the module descriptions with care so that you choose modules which match your own needs, interests and level.

   TuTa students, however, take ONE module from the free-choice menu and then, in second year autumn, the Business Plan module, which is integrated with a course in their own department (*555222A Tuotantotalouden harjoitustyöt*) .

STUDENTS OF ARCHITECTURE:
The course consists of two modules:
See the course description of each module (902011P-38 module A and 902011P-39 module B for a detailed explanation of the course content.

Mode of delivery:

STUDENTS OF ENGINEERING: The mode of delivery varies according to the modules you take. See the course descriptions for the individual modules.
STUDENTS OF ARCHITECTURE: face-to-face teaching in the premises of your own department and independent study

Learning activities and teaching methods:

STUDENTS OF ENGINEERING: The teaching methods and learning activities depend on which free-choice modules you choose. See the course descriptions for the individual modules.
STUDENTS OF ARCHITECTURE:
The classroom teaching comprises about 50% of the total student workload for the course and includes mini-lectures, group and teamwork, student presentations. The independent work component comprises online work and independent study in preparation for classroom activities.

Target group:

Students of the Faculty of Technology
- all Engineering Departments
- the Department of Architecture

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Materials will be provided by the teacher and a copy fee will be charged where applicable.

Assessment methods and criteria:

Assessment methods vary according to the individual modules taken. The assessment criteria are based on the learning outcomes of the module.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

pass / fail.

Person responsible:

Each department in the Technical Faculty has its own Languages and Communication contact teacher for questions about English studies.

Working life cooperation:

-

Other information:

See the Languages and Communication Study Guide, English, TTK.

903012P: Technical German 3, 6 op

Voimassaolo: 01.08.1995 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Language Centre
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: German

Ei opintojaksokuvauksia.

477990A: Bachelor's Thesis / Process Engineering, 8 op

Voimassaolo: 01.08.2007 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

488990A Bachelor's Thesis / Enviromental Engineering 8.0 op

Ei opintojaksokuvauksia.

477994A: Maturity Test / Bachelor of Science in Process Engineering Technology, 0 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

900060A: Technical Communication, 2 op

Voimassaolo: 01.08.2005 - 31.07.2021
Opiskelumuoto: Intermediate Studies
Laji: Course

Vastuuyksikkö: Language Centre

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay900060A	Technical Communication (OPEN UNI)	2.0 op
470218P	Written and Oral Communication	3.0 op

Proficiency level:
-
Status:
This course unit is compulsory for students of Electrical Engineering, Computer Science, Communications Technologies and Engineering Mechanical Engineering, Process and Environmental Engineering.
Required proficiency level:
-
ECTS Credits:
2 credits
Language of instruction:
Finnish
Timing:
Electrical Engineering, Computer Science and Engineering and Communications Technologies: 2nd year spring term or 3rd year autumn term or 3rd year spring term.
Mechanical Engineering: 3rd year.
Process and Environmental Engineering: 2nd year spring term or 3rd year autumn term.
Learning outcomes:
Upon completion of the course the student should be familiar with the central principles of work and study-related communication, both oral and written, and be able to apply this knowledge in his/her own communication. The student should be able to prepare and give an illustrative and understandable oral presentation on a topic related to his/her own field in a way that suits the audience and the situation. The student should also be able to seek information and report on his/her findings in writing. The student should be able to analyse and assess his/her own writing and the writing of his/her peers. He/she should be able to act in group communication situations in a target-oriented manner. The student should also be able to give and receive constructive criticism.
Contents:
Professional communication skills: team writing, the process of writing and its different stages, distinctive features of formal scientific and professional texts, oral communication, preparing an illustrative presentation, methods of convincing one's audience, giving and receiving constructive criticism, the features of a functioning team, the group process and the roles of team members, negotiations and meeting practices.
Mode of delivery:
Multimodal teaching
Learning activities and teaching methods:
Contact hours ca. 14 h and independent group work or self-study ca. 40 h.
Target group:
Students of the Faculty of Technology
Prerequisites and co-requisites:
-
Recommended optional programme components:
-
Recommended or required reading:
Kauppinen, Anneli & Nummi, Jyrki & Savola, Tea: Tekniikan viestintä: kirjoittamisen ja puhumisen käsikirja (EDITA); Nykänen, Olli: Toimivaa tekstiä: Opas tekniikasta kirjoittaville (TEK) and material in Optima study environment.
Assessment methods and criteria:
Active participation in contact teaching, independent study and completion of given assignments.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Pass / fail
Person responsible:
Kaija Oikarainen
Working life cooperation:
-
Other information:
All students are required to attend the first meeting of the course unit so the work groups can be formed and work started in a timely and efficient manner. When signing up for the course unit, you should keep in mind that completing it requires a responsible attitude and a strong commitment to the work because the teamwork-based exercises rely

heavily on the participation and activity of the students.
If the student is involved in the University's student associations or functions in a position of trust in university government, student union administration or Oulun Teekkariyhdistys ry (or in its subordinate guilds), he/she may be relieved of some of the group communication exercises. These compensatory actions must always be agreed upon separately with the course unit's teacher. The student must present an official statement from a person in charge of the governing body or association, which details the student's tasks and involvement with that body or association. Participation that took place over five years ago does not entitle the student to any compensation.

A432120: Basic and Intermediate Studies, Environmental Engineering, 99,5 - 120,5 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Basic and Intermediate Studies
Laji: Study module
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Compulsory

477011P: Introduction to Process and Environmental Engineering I, 5 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Basic Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Aki Sorsa
Opintokohteen kielet: Finnish
Leikkaavuudet:

470219A	Introduction to Process Engineering	3.5 op

ECTS Credits:

5 cr

Language of instruction:

Finnish

Timing:

Implementation during periods 1-3

Learning outcomes:

Objective: To give insight to the whole perspective of process and environmental engineering and to familiarise the students with the terminology involved. The objective is also to outline the connections between process and environmental engineering and other fields closely related to them.
Learning outcomes: After the course, the student can analyse the process and environmental engineering aspects of an industrial process. He/She can, for example, divide the process into unit processes, analyse the process or a chain of processes based on the material balances, identify and evaluate the significance of essential mechanical, chemical and transport phenomena, analyse the control and process design aspects of a process etc. He/She can also evaluate the significance of different aspects of process and environmental engineering to the overall production system when these aspects are further examined in forthcoming courses.

Contents:

The course divides into eight separate themes: 1. Unit processes and material balances. 2. Environmental impacts and their classification. 3. Mechanical phenomena. 4. Momentum, heat and mass transfer phenomena. 5. Chemical reactions and reactors. 6. The possibilities of biological process engineering. 7. Process dynamics and control. 8. Process measurements and measurability.

Mode of delivery:

Contact lectures

Learning activities and teaching methods:

Assignments (8 altogether) carried out in small groups and contact lectures supporting them (16 hours).

Target group:

Bachelor's degree students in the Department of Process and Environmental Engineering

Prerequisites and co-requisites:

None

Recommended optional programme components:

The course serves as an introduction to the studies in process and environmental engineering.

Recommended or required reading:

The material is provided during the contact lectures and through the course webpages. It is expected also that the students seek the material for completing the assignments independently.

Assessment methods and criteria:

The assignments (8 altogether) covering the course themes carried out in small groups.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilises a numerical grading scale 1-5 and fail.

Person responsible:

M.Sc. (eng) Aki Sorsa

Working life cooperation:

No.

Other information:

The assessment method utilised requires the attendance in contact lectures from the beginning of the course.

488010P: Introduction to Process and Environmental Engineering II, 5 op

Voimassaolo: 01.08.2013 -
Opiskelumuoto: Basic Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Fabritius, Timo Matti Juhani
Opintokohteen kielet: Finnish
Leikkaavuudet:

488011P	Introduction to Environmental Engineering	5.0 op
477012P	Introduction to Automation Engineering	5.0 op

ECTS Credits:

5 cr

Language of instruction:

Finnish

Timing:

Implementation in 4 th to 6 th periods.

Learning outcomes:

Students can examine industrial processes using the methods and perspectives of process and environmental engineering (e.g. environmental load of processes, use of land and water recourses, control and design of processes…) and they recognize the role of different areas of the process and environmental engineering, when these areas are considered in the forthcoming courses.

Contents:

1. Environmental thinking and industrial ecology. 2. Materials in production processes. 3. Water resources and land use. 4. Municipal and industrial water supply. 5. PI diagrams. 6. Process design. 7. Control and operation of processes.

Mode of delivery:

Classroom education

Learning activities and teaching methods:

Group exercises and contact-education that supports these exercises. Only in Finnish.

Target group:

Students of process and environmental engineering

Prerequisites and co-requisites:

None

Recommended optional programme components:

This course is an introduction to the other courses of process and environmental engineering.

Recommended or required reading:

Material will be distributed during lectures and exercises.

Assessment methods and criteria:

Group-exercises. Please note that the course is not organised for the English speaking students.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Failed, 1, 2, 3, 4 and 5.

Person responsible:

professor Timo Fabritius

Working life cooperation:

No.

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.

488201A: Environmental Ecology, 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Leikkaavuudet:

488210A	Environmental science and technology	5.0 op
ay488201A	Environmental Ecology (OPEN UNI)	5.0 op
488406A	Introduction to Environmental Science	5.0 op
480001A	Environmental Ecology	5.0 op

ECTS Credits:

5 cr

Language of instruction:

English

Timing:

Implementation in spring semester during 4 th and 5 th period.

Learning outcomes:

The student is able to define the basic concepts of environmental ecology. He/she has knowledge about the state of the environment and is able to explain the essential environmental problems and the main effects of pollution. In addition, the student knows some solutions to environmental problems and is aware of ethical thinking in environmental engineering. The student also has basic knowledge about toxicology and epidemiology.

Contents:

Principles of environmental ecology. Roots of environmental problems. Global air pollution: ozone depletion, acid deposition, global warming and climate change. Water pollution, eutrophication, overexploitation of ground and surface water. Main effects of pollution and other stresses. Non-renewable and renewable energy. Energy conservation and efficiency. Hazardous and solid waste problem. Principles of toxicology, epidemiology, and risk assessment. Environmental ethics.

Mode of delivery:

web-based learning.

Learning activities and teaching methods:

E-learning in the Optima learning environment.

Target group:

Bachelor's degree students of environmental engineering.

Prerequisites and co-requisites:

The courses 477011P Introduction to Process and Environmental Engineering I and 488011P Introduction to Environmental Engineering recommended beforehand.

Recommended optional programme components:

-

Recommended or required reading:

Chiras D.: Environmental Science: Creating a Sustainable Future. New York, Jones and Bartlett Publishers, 2001.

Assessment methods and criteria:

Exercises and exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

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

Person responsible:

University researcher Satu Ojala

Working life cooperation:

No

Other information:

-

488102A: Hydrological Processes, 5 op

Opiskelumuoto: Intermediate Studies
Laji: Course
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 cr

Language of instruction:

Finnish, self-study package in English

Timing:

The course unit is held in the spring semester, during periods 4-5 but the self-study package in English cab be done in periods 1-6.

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 relation 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, open channel flow, flow in pipe systems.

Mode of delivery:

Face-face teaching in Finnish, self-study package in English

Learning activities and teaching methods:

For self-study package course, 4 tutor sessions are arranged during the semester.

Target group:

Students in international programs of environmental engineering

Prerequisites and co-requisites:

No

Recommended optional programme components:

The course is a prerequisite for 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, 3 rd Edition, ISBN 0-07-020509-4)

Assessment methods and criteria:

Both hydrology and hydraulics 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 assignments (80%) and examination (20%).
Read more about assessment criteria at the University of Oulu webpage.

Grading:

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

Person responsible:

University Lecturer A-K Ronkanen

Working life cooperation:

No

Other information:

-

031010P: Calculus I, 5 op

Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Mathematics Division
Arvostelu: 1 - 5, pass, fail
Opettajat: Ilkka Lusikka
Opintokohteen kielet: Finnish
Leikkaavuudet:

ay031010P	Calculus I (OPEN UNI)	5.0 op

ECTS Credits:

5

Language of instruction:

Finnish

Timing:

Autumn semester, periods 1-3.

Learning outcomes:

After completing the course the student identifies concepts of vector algebra and can use vector algebra for solving problems of analytic geometry. The student can also explain basic characteristics of elementary functions and is able to analyse the limit and the continuity of real valued functions of one variable. Furthermore, the student can solve problems associated with differential and integral calculus of real valued functions of one variable.

Contents:

Vector algebra and analytic geometry. Limit, continuity, differential and integral calculus and applications of real valued functions of one variable. Complex numbers.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 55 h / Group work 22 h.

Target group:

-

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Grossmann, S.I.: Calculus of One Variable; Grossmann, S.I.: Multivariable Calculus, Linear Algebra and Differential Equations (partly); Adams, R.A.: A Complete Course Calculus (partly).

Assessment methods and criteria:

Intermediate exams or a final exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 1-5.

Person responsible:

Ilkka Lusikka

Working life cooperation:

-

Other information:

-

031017P: Differential Equations, 4 op

Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Mathematics Division
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

800320A	Differential equations	5.0 op
031076P	Differential Equations	5.0 op

ECTS Credits:

4

Language of instruction:

Finnish

Timing:

Spring, period 4-6

Learning outcomes:

The students can apply differential equations as a mathematical model. They can identify and solve various differential equations and they have knowledge on basic solvability of differential equations. The student can use the Laplace transform as a solution method.

Contents:

Ordinary differential equations of first and higher order. Laplace transform with applications to differential equations.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 44 h / Group work 28 h.

Target group:

-

Prerequisites and co-requisites:

The recommended prerequisite is the completion of the course 031010P Calculus I.

Recommended optional programme components:

-

Recommended or required reading:

Kreyszig, E.: Advanced Engineering Mathematics

Assessment methods and criteria:

Intermediate exams or a final exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 1-5.

Person responsible:

Martti hamina

Working life cooperation:

-

Other information:

-

031019P: Matrix Algebra, 3,5 op

Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Mathematics Division
Arvostelu: 1 - 5, pass, fail
Opettajat: Matti Peltola
Opintokohteen kielet: Finnish
Leikkaavuudet:

031078P	Matrix Algebra	5.0 op

ECTS Credits:

3,5

Language of instruction:

Finnish

Timing:

Autumn semester, periods 1-3

Learning outcomes:

After completing the course the student is able to apply arithmetic operations of matrices. He can solve system of linear equations by matrix methods and can apply iterative methods to find the solution of the system of linear equations. The student is able to recognise the vector space and can relate the consepts of linear transform and matrix. He can analyse matrices by the parameters, vectors and vector spaces of matrices. The student is able to diagonalize matrices and apply diagonalization to the simple applications.

Contents:

Vectors and matrices. Systems of linear equations. Vector spaces and linear transformations. The rank, nullity, row space and the column space of a matrix. The determinant of a matrix. Eigenvalues and eigenvectors of a matrix. The diagonalization with applications. The iterative methods of solving linear system of equations. The theorems of Gershgorin and Cayley- Hamilton.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 40 h / Group work 20 h.

Target group:

-

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Grossman, S.I. : Elementary Linear Algebra, David C. Lay: Linear Algebra and Its Applications.

Assessment methods and criteria:

Intermediate exams or a final exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 1-5.

Person responsible:

Matti Peltola

Working life cooperation:

-

Other information:

-

031021P: Probability and Mathematical Statistics, 5 op

Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Mathematics Division
Arvostelu: 1 - 5, pass, fail
Opettajat: Jukka Kemppainen
Opintokohteen kielet: Finnish
Leikkaavuudet:

ay031021P	Probability and Mathematical Statistics (OPEN UNI)	5.0 op

ECTS Credits:

5

Language of instruction:

Finnish

Timing:

Spring semester, periods 4-6

Learning outcomes:

After completing the course the student knows the key concepts of probability and the most important random variables and is able to use them in calculating probabilities and parameters of probability distributions. In addition, the student is able to analyze statistical data by calculating interval and point estimates for the parameters. The student is also able to formulate statistical hypotheses and test them.

Contents:

The key concepts of probability, random variable, parameters of probability distributions, estimation of parameters, hypothesis testing.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 44 h/Exercises 22 h/Self-study 68 h.

Target group:

-

Prerequisites and co-requisites:

The recommended prerequisites are the course 031010P Calculus I and some parts of the course 031011P Calculus II.

Recommended optional programme components:

-

Recommended or required reading:

Milton, J.S., Arnold, J.C. (1992): Introduction to Probability and Statistics.

Assessment methods and criteria:

Intermediate exams or a final exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 1-5.

Person responsible:

Jukka Kemppainen

Working life cooperation:

-

Other information:

-

031022P: Numerical Analysis, 5 op

Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Mathematics Division
Arvostelu: 1 - 5, pass, fail
Opettajat: Marko Huhtanen
Opintokohteen kielet: Finnish

ECTS Credits:

5

Language of instruction:

Finnish

Timing:

Spring semester, periods 4-5

Learning outcomes:

The student recognizes what numerical solution methods can be used to solve some spesific mathematical problems, can perform the required steps in the numerical algorithm and is able to perform the error analysis.

Contents:

Numerical linear algebra. Numerical methods for systems of equations, Basics of the approximation theory. Numerical quadratures. Numerical methods for ordinary and partial differential equations.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 44 h / Group work 22 h.

Target group:

-

Prerequisites and co-requisites:

The recommended prerequisite is the completion of the courses Calculus I and II, Differential Equations and Matrix algebra.

Recommended optional programme components:

-

Recommended or required reading:

J. Douglas Faires and Richar L. Burden, Numerical methods; Alfio Quarteroni, Riccardo Sacco, Fausto Saleri, Numerical mathematics

Assessment methods and criteria:

Intermediate exams or a final exam.

Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 1-5.

Person responsible:

Marko Huhtanen

Working life cooperation:

-

Other information:

-

761121P: Laboratory Exercises in Physics 1, 3 op

Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Department of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

761115P	Laboratory Exercises in Physics 1	5.0 op
761118P-01	Mechanics 1, lectures and exam	0.0 op
761115P-02	Laboratory Exercises in Physics 1, laboratory exercises	0.0 op
761115P-01	Laboratory Exercises in Physics 1, lecture and exam	0.0 op
761114P-01	Wave motion and optics, lectures and exam	0.0 op
761113P-01	Electricity and magnetism, lectures and exam	0.0 op

ECTS Credits:

3 credits

Language of instruction:

The lectures and the instruction material will be in Finnish. The laboratory experiments will be made in groups guided either in Finnish or in English.

Timing:

Autumn, spring.

Learning outcomes:

The student can safely make physical measurements, use different measurement tools, read different scales, handle the data, calculate the error estimations and make a sensible report of his laboratopy measurements.

Contents:

The skill to make laboratory measurements is important for physicists. This is an introductory course how to make physical measurements and how to treat the measured data. Laboratory works are made in groups. The laboratory security is an essential part also in physics. Measurements are made with different instruments. As a result the most probable value is determined as well as its error. The skills obtained during this course can be applied in the other laboratory courses Laboratory exercises in physics 2 and 3.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 12 h, exercises 20 h (5 x 4 h). Five different works will be made during the course in groups. Self-study 48 h.

Target group:

No specific target qroup

Prerequisites and co-requisites:

No specific prerequisites

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously

Recommended or required reading:

A booklet: Fysiikan laboratoriotyöt I, laboratoriotöiden työohje. Course material is in Finnish. A few English material is available in teaching laboratory.

Assessment methods and criteria:

Written reports of the experiments and one written examination.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Kari Kaila

Working life cooperation:

No work placement period

Other information:

https://wiki.oulu.fi/display/761121P/
Registration for the course and exams will be found by using the code 761121P-01

761101P: Basic Mechanics, 4 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Physics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

761118P Mechanics 1 5.0 op
761118P-01 Mechanics 1, lectures and exam 0.0 op
761118P-02 Mechanics 1, lab. exercises 0.0 op
761111P-01 Basic mechanics, lectures and exam 0.0 op
761111P-02 Basic mechanics, lab. exercises 0.0 op
761111P Basic mechanics 5.0 op
761101P2 Basic Mechanics 4.0 op

ECTS Credits:

4 credits

Language of instruction:

The lectures will be in Finnish. The textbook is in English and exercises are selected from the textbook. For further information, contact the responsible person of the course.

Timing:

Autumn

Learning outcomes:

The student is able to describe the basic concepts of mechanics and to apply those when solving the problems related to mechanics.

Contents:

We encounter many phenomena related to mechanics in our everyday life. Most engineering sciences are based on mechanics and mechanics forms the basis of many other fields of physics, including modern physics.
Contents in brief: Short summary of vector calculus. Kinematics, projectile motion and circular motion. Newton's laws of motion. Work and different forms of energy. Momentum, impulse and collisions. Rotational motion and moment of inertia. Torque and angular momentum. Rigid body equilibrium problems. Gravitation. Periodic motion. Fluid mechanics.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 32 h, 8 exercises (16 h), self-study 59 h

Target group:

For the students of the University of Oulu

Prerequisites and co-requisites:

Knowledge of vector calculus and basics of differential and integral calculus

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously

Recommended or required reading:

Text book: H.D. Young and R.A. Freedman: University physics, Addison-Wesley, 13th edition, 2012, chapters 1-14. Also older editions can be used.
Lecture material: Finnish lecture material will be available on the web page of the course.
Course material availability can be checked here.

Assessment methods and criteria:

Four mini examinations and end examination or final examination
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Anita Aikio

Working life cooperation:

No work placement period

Other information:

https://wiki.oulu.fi/display/761101P/

761103P: Electricity and Magnetism, 4 op

Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Department of Physics
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

761119P Electromagnetism 1 5.0 op
761119P-01 Electromagnetism 1, lectures and exam 0.0 op
761119P-02 Electromagnetism 1, lab. exercises 0.0 op
761113P-01 Electricity and magnetism, lectures and exam 0.0 op
761113P-02 Electricity and magnetism, lab. exercises 0.0 op
761113P Electricity and magnetism 5.0 op
766319A Electromagnetism 7.0 op

ECTS Credits:

4 credits

Language of instruction:

The lectures will be in Finnish. The textbook is in English and exercises are selected from the textbook. For further information, contact the responsible person of the course.

Timing:

Spring

Learning outcomes:

The student is able to describe the basic concepts of electricity and magnetism and to apply those when solving the problems related to electromagnetism.

Contents:

Electromagnetic interaction is one of the four fundamental interactions in physics and many phenomena like light, radio waves, electric current, magnetism and formation of solid matter are based on electromagnetism. The current technological development is largely based on applications of electromagnetism in energy production and transfer, telecommunications and information technology. Contents in brief: Coulomb's law. Electric field and potential. Gauss's law. Capacitors and dielectrics. Electric current, resistors, electromotive force and DC circuits. Magnetic field, motion of a charged particle in electric and magnetic fields, and applications. Ampère's law and Biot-Savart law. Electromagnetic induction and Faraday's law. Inductance and inductors. R-L-C circuits, alternating current and AC circuits.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 32 h, 6 exercises (12 h), self-study 63 h

Target group:

For the students of the University of Oulu.

Prerequisites and co-requisites:

Knowledge of vector calculus and basics of differential and integral calculus are needed.

Recommended optional programme components:

No alternative course units or course units that should be completed simultaneously

Recommended or required reading:

Text book: H.D. Young and R.A. Freedman: University physics, Addison-Wesley, 13th edition, 2012, chapters 21-31. Also older editions can be used.
Lecture material: Finnish lecture material will be available on the web page of the course.

Course material availability can be checked here.

Assessment methods and criteria:

Four mini examinations and end examination or final examination
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Anita Aikio

Working life cooperation:

No work placement period

Other information:

https://wiki.oulu.fi/display/761103P/

780109P: Basic Principles in Chemistry, 4 op

Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Minna Tiainen
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
780101P	Introduction to Physical Chemistry	7.0 op
780101P2	Physical Chemistry I	4.0 op
780107P	Basic Course in Inorganic and Physical Chemistry	7.5 op
780152P	Inorganic and Physical Chemistry I	7.5 op
780153P	General and Inorganic Chemistry	7.5 op
780154P	Basic Inorganic Chemistry	7.5 op

ECTS Credits:

4 credits/107 hours of work

Language of instruction:

Finnish

Timing:

1st autumn

Learning outcomes:

Upon completion of the course, the student will be able to display an understanding of basic chemistry phenomenon; equilibrium of acids and bases, chemical equilibrium, redox reactions and stoichiometry.

Contents:

Introduction to chemistry, stoichiometry, redox reactions, chemical equilibrium, the equilibrium of acid and bases, buffer solutions, titration.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

36 hours of lectures/ self –study 71 hours

Target group:

Biology, Geology, Mechanical Engineering, Process Engineering, Environmental Engineering compulsory. Geography, optional.

Prerequisites and co-requisites:

No specific prerequisites

Recommended optional programme components:

This course has partly the same contents as the courses General and Inorganic Chemistry I and II (780114P and 780115P) or Introduction to Chemistry (780113P) (and the course Introduction to Physical Chemistry). If the student performs also the courses Inorganic Chemistry I and II (780114P and 780115P) or Introduction to Chemistry, this course will be cancelled in his/hers study register.

Recommended or required reading:

Petrucci, R.H., Harwood, W.S., and Herring, F.G.: General Chemistry: Principles and Modern Applications, Prentice Hall, 8th edition (2002) (Chapters 1-6, 10, 16-18) or a newer edition.

Assessment methods and criteria:

Final examination
Read more about assessment criteria at the University of Oulu webpage.

Grading:

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

Person responsible:

Lecturer Minna Tiainen

Working life cooperation:

No

Other information:

This course is only for students who have chemistry as a minor subject.

780112P: Introduction to Organic Chemistry, 4 op

Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opettajat: Johanna Kärkkäinen
Opintokohteen kielet: Finnish
Leikkaavuudet:

ay780112P	Introduction to Organic Chemistry (OPEN UNI)	4.0 op
780103P	Introduction to Organic Chemistry	6.0 op
780103P2	Organic Chemistry I	6.0 op
780108P	Basic Course in Organic Chemistry	6.0 op

ECTS Credits:

4 credits/107 hours of work

Language of instruction:

Finnish. Book-examination in English as well.

Timing:

1 st autumn and 1 st spring

Learning outcomes:

Upon completion of the course, the student can identify functional groups and structures of organic compounds, nomenclature, properties and reactions, can describe fundamentals of organic chemistry and use its terminology.

Contents:

Functional groups and nomenclature of organic compounds, basic principles of stereochemistry, reactions with applications.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

32 hours of lectures and applications, 75 hours of self study

Target group:

Biology, Process Engineering, Environmental Engineering, compulsory.
Physical Sciences, Geology, Geograhpy, Mathematical Sciences, optional.

Prerequisites and co-requisites:

Upper secondary school chemistry

Recommended optional programme components:

This 4 credits course is a part of the course 780103P Intrduction to organic Chemistry 6 credits. Hence, students attend the lectures of 780103 P Introduction of Organic Chemistry 6 credits.
The student can make up this couse to the course 780103 P Intrduction to organic Chemistry 6 credits.

Recommended or required reading:

Hart, H., Hart, D.J. and Craine, L.E.: Organic Chemistry: A Short Course, 10 th or a newer edition, Houghton Mifflin Boston, 1999; Hart, H., Hart, D.J. and Craine, L.E.: Study Guide & Solutions Book, Organic Chemistry: A Short Course, 10th or a newer edition, Houghton Mifflin Boston, 1999.

Assessment methods and criteria:

Two intermediate examinations or one final examination
Read more about assessment criteria at the University of Oulu webpage.

Grading:

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

Person responsible:

Ph.D. Johanna Kärkkäinen

Working life cooperation:

No

Other information:

Students attend the lectures of 780103 P Introduction of Organic Chemistry 6 credits.

780122P: Introductory Laboratory Course in Chemistry, 3 op

Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Department of Chemistry
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

ECTS Credits:

3 credits/80 hours of work

Language of instruction:

Finnish

Timing:

1st autumn or spring

Learning outcomes:

After this course the student can apply laboratory safety instructions and act accordingly. He/she can communicate by using basic laboratory terminology and work in a group under the guidance. The student identifies basic laboratory tools and can use them properly. He/she can perform basic inorganic determinations: acid-base titrations, mass analysis or spectroscopic measurements and can apply them to analyze inorganic synthetic products, or use study thin layer chromatography to study purity of organic products. The student can write a report related to the performance and analysis of the synthesis.

Contents:

Laboratory safety, Bunsen burner, balances, volumetric measures, gravimetric determination, acid-base titration, pH, titration curves, acid-base indicators, buffer solutions, synthesis and analysis of an inorganic product, spectrophotometric determination, an organic synthesis, TLC. Written report.

Mode of delivery:

Supervised laboratory work

Learning activities and teaching methods:

Safety in laboratory 2 hours, 40 hours of laboratory work + demonstrations, 38 hours of self study

Target group:

Biochemistry, Biology, Chemistry, Process Engineering, Environmental engineering, compulsory. In the entity of 25 credits, compulsory. Physical Sciences, Geology, Mathematical Sciences, optional.

Prerequisites and co-requisites:

Basic Principles in Chemistry (780109P) or Introduction to Chemistry (780113P) passed, or participation in the courses General and Inorganic Chemistry I (780114P) and General and Inorganic Chemistry II (780115P).

Recommended optional programme components:

The course Basic Principles in Chemistry (780109P) or Introduction to Chemistry (780113P) passed, or Biochemistry, Chemistry and teacher education students of Mathematics and Physics: simultaneous participation in the courses General and Inorganic Chemistry I (780114P) and General and Inorganic Chemistry II (780115P).

Recommended or required reading:

Instruction Book (in Finnish): Kemian perustyöt

Assessment methods and criteria:

Final examination. Laboratory works and final examination has to be completed within next two terms. Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course utilizes verbal grading scale pass/fail.

Person responsible:

Prof. Marja Lajunen and teaching assistants

Working life cooperation:

No

Other information:

Attendance at the lecture of Safety at work is compulsory. Deadline of the written report is binding. Failure will lead to the renewal of the work.

477201A: Material and Energy Balances, 5 op

Voimassaolo: 01.08.2005 - 31.12.2019
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

477221A	Material and Energy Balances	5.0 op
470220A	Fundamentals of Chemical Process Engineering	5.0 op

ECTS Credits:

5 cr

Language of instruction:

Finnish.

Timing:

Periods 1-2.

Learning outcomes:

The student is able to formulate material and energy balances for a process by taking into account the restrictions set by reaction stoichiometry. The student knows how the created mathematical formulation can be exploited in process consideration.

Contents:

Formulation of material and energy balances by taking into account the effects of chemical reactions.

Mode of delivery:

Lectures and group exercises.

Learning activities and teaching methods:

Lectures 40h and Self-study 90h

Target group:

Bachelor students in DPEE

Prerequisites and co-requisites:

Basics from the course Introduction to Process Engineering.

Recommended optional programme components:

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Recommended or required reading:

Reklaitis, G.V.: Introduction to Material and Energy Balances. John Wiley & Sons, 1983. ISBN 0-471-04131-9.

Assessment methods and criteria:

Continual assessment based on exams and group exercises.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Scale 1-5

Person responsible:

University Teacher Ilkka Malinen

Working life cooperation:

No

Other information:

-

477401A: Thermodynamic Equilibria, 5 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Eetu-Pekka Heikkinen
Opintokohteen kielet: Finnish
Leikkaavuudet:

470611A	Metallurgy Processes	7.0 op

ECTS Credits:

5 cr

Language of instruction:

Finnish

Timing:

Implementation in 2nd period.

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

Learning activities and teaching methods:

Lectures, software exercise as well as other exercises. Only in Finnish.

Target group:

Students of process and environmental engineering

Prerequisites and co-requisites:

'Kemian perusteet' and 'Material and Energy Balances' as prerequisities.

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:

Material will be distributed during lectures and exercises.

Assessment methods and criteria:

Students are required to make a portfolio consisting of a learning diary and exercices. Please note that the course is not organised for the English speaking students.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Failed, 1, 2, 3, 4 and 5.

Person responsible:

University teacher Eetu-Pekka Heikkinen

Working life cooperation:

No

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.

477301A: Momentum Transfer, 3 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Ainassaari, Kaisu Maritta, Tuomaala, Eero Juhani

Opintokohteen kielet: Finnish

Leikkaavuudet:

477052A	Fluid Mechanics	5.0 op
470619A	Fluid Mechanics	3.0 op

ECTS Credits:

3 cr

Language of instruction:

Finnish, can be completed in English as a book examination.

Timing:

Implementation in spring semester during 4 th period.

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. Macroscopic balances. Basic principles of computational fluid dynamics (CFD).

Mode of delivery:

Lectures including exercises.

Learning activities and teaching methods:

Lectures 20 h, exercises 15 h and homework 10 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:

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:

Bird, R.B., Stewart, W.E. & Lightfoot, E.N., Transport phenomena, John Wiley & Sons, 1976, 780 p. *Additional literature:* Jokilaakso, A., Virtaustekniikan, lämmönsiirron ja aineensiirron perusteet, 496, Otakustantamo, 1987, 194 p. Coulson, J.F. et al., Chemical engineering vol.1, 4th ed., Pergamon Press, 1990. 708 p. Shaw, C.T., Using computational fluid dynamics, Prentice Hall, 1992, 251 p.

Assessment methods and criteria:

Examination or continuous evaluation.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

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

Person responsible:

University teacher Eero Tuomaala

Working life cooperation:

No

Other information:

-

477302A: Heat Transfer, 3 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Tuomaala, Eero Juhani

Opintokohteen kielet: Finnish

Leikkaavuudet:

477322A	Heat and Mass Transfer	5.0 op
470620A	Heat Transfer	3.0 op

ECTS Credits:

3 cr

Language of instruction:

Finnish, can be completed in English as a book examination.

Timing:

Implementation in spring semester during 5 th period.

Learning outcomes:

After passing the course the student knows what happens when heat is transferred by conduction, convection and radiation. After the course the student can describe energy transfer with differential energy balances connected with momentum 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. 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 is able to divide the costs of the used energy in right proportion based on the processing stage.

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.

Mode of delivery:

Lectures including exercises.

Learning activities and teaching methods:

Lectures 20 h, exercises 15 h and homework 10 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:

Course 477301A Momentum Transfer is 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:

Bird, R, B., Stewart, W.E. & Lightfoot, E.N., Transport Phenomena, John Wiley & Sons, 1976, 780 p.; Linnhoff, B. et al.: A User Guide on Process Integration for the Efficient Use of Energy, The Institution of Chemical Engineers, 1987, 247 p.
Additional literature: Jokilaakso, A., Virtaustekniikan, lämmönsiirron ja aineensiirron perusteet, 496, Otakustantamo, 1987, 194 p. Coulson, J.F. et al., Chemical engineering vol.1, 4th ed., Pergamon Press, 1990. 708 p. Peters, M.S. &Timmerhaus, K.D., Plant design and economics for chemical engineers, 4th ed., McGraw-Hill, 1991, 910 p. Sussman, M.V., Availability (exergy) analysis, Mulliken House, 1985, 94 p.

Assessment methods and criteria:

Examination or continuous evaluation.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

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

Person responsible:

University teacher Eero Tuomaala

Working life cooperation:

No

Other information:

-

477303A: Mass Transfer, 3 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Ainassaari, Kaisu Maritta, Tuomaala, Eero Juhani
Opintokohteen kielet: Finnish
Leikkaavuudet:

477322A	Heat and Mass Transfer	5.0 op
470621A	Mass Transfer	3.0 op

ECTS Credits:

3 cr

Language of instruction:

Finnish, can be completed in English as a book examination.

Timing:

Implementation in autumn semester during 1 st period.

Learning outcomes:

After the course the 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 theories of Fick and Maxwell-Stefan and to compare the models to each other. 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:

Diffusion. The laws of diffusion by Fick and Maxwell-Stefan.Mass transfer in simple systems. Differential mass balances. Models of mass transfer in turbulent systems. Interphase mass transfer. Absorption.Drying of solid.

Mode of delivery:

Lectures including exercises.

Learning activities and teaching methods:

Lectures 20 h, exercises 15 h and homework 10 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:

Courses 477301A Momentum Transfer and 477302A 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:

Bird, R,B., Stewart, W.E. & Lightfoot, E.N.: Transport Phenomena, John Wiley & Sons, 1976, 780 p.; King, C.J.: Separation Processes, McGraw-Hill, 1980, 850 p.; Wesselingh J.A. & Krishna R.: Mass Transfer, Ellis Horwood, 1990, 243 p.
Additional literature: Jokilaakso, A., Virtaustekniikan, lämmönsiirron ja aineensiirron perusteet, 496, Otakustantamo, 1987, 194 p.; Coulson, J.F. et. al.: Chemical Engineering vol.1, 4th ed., Pergamon Press, 1990. 708 p.; McCabe, W.L. et al.: Unit Operations of Chemical Engineering, 5th ed., McGraw-Hill, 1993, 1130 p.

Assessment methods and criteria:

Examination or continuous evaluation.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

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

Person responsible:

University teacher Kaisu Ainassaari

Working life cooperation:

No

Other information:

-

477202A: Reactor Analysis, 4 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Ahola, Juha Lennart
Opintokohteen kielet: Finnish
Leikkaavuudet:

477222A	Reactor Analysis	5.0 op
470221A	Reactor Analysis and Design I	5.0 op

ECTS Credits:

4 cr

Language of instruction:

Finnish

Timing:

Period 3.

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 36h and Self-study 70h

Target group:

Bachelor students in DPEE

Prerequisites and co-requisites:

Objectives of 477201A Material and Energy Balances and 477401A Thermodynamic Equilibrium

Recommended optional programme components:

-

Recommended or required reading:

Lecture handout. Levenspiel, O., Chemical Reaction Engineering. John Wiley & Sons, New York, 1972 (Chapters 1-8). Atkins, P.W.: Physical Chemistry, Oxford University Press, 2002. 7 th Ed. (Parts) ISBN 0-19-879285-9

Assessment methods and criteria:

Combination of examination and group exercises.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Scale 1-5

Person responsible:

University Lecturer Juha Ahola

Working life cooperation:

No

Other information:

-

477101A: Particle Technology, 3 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Ari Ämmälä
Opintokohteen kielet: Finnish
Leikkaavuudet:

477121A	Particle Technology	5.0 op
470101A	Mechanical Process Engineering I	5.0 op

ECTS Credits:

3 cr

Language of instruction:

Finnish

Timing:

Implementation in period 3.

Learning outcomes:

Upon completion of the course, a student should be able to identify the mainline mechanical processes enhancing the degree of upgrading, as well as recovery operations related to those mechanical main processes. The student is able to identify the equipments related to the mechanical processes and can explain their purpose of use and their operational principles.

Contents:

Granular material and sampling, particle size and particle size distribution, specific surface area, basics in grinding, crushing, sieving and mineral concentration, froth flotation, mineral concentration methods based

on density difference, magnetic concentration and other concentration methods, granulation, separation from suspensions.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures and exercises.

Target group:

Bachelor students in process and environmental engineering

Prerequisites and co-requisites:

Introduction to Process Engineering 477011P

Recommended optional programme components:

-

Recommended or required reading:

Lecture materials and other materials that will be announced at the lectures.

Assessment methods and criteria:

Exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

0-5

Person responsible:

Education coordinator

Working life cooperation:

No

Other information:

Literature exam possible for foreign students.

477102A: Bulk Solids Handling, 4 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Ari Ämmälä
Opintokohteen kielet: Finnish
Leikkaavuudet:

477122A	Bulk Solids Handling	5.0 op
470103A	Mechanical Process Engineering III	5.0 op
470102A	Mechanical Process Engineering II	5.0 op

ECTS Credits:

4 cr

Language of instruction:

Finnish

Timing:

Implementation in period 4.

Learning outcomes:

Upon completion of the course, a student should be able to identify auxiliary mechanical unit processes as well as equipments and phenomena related to them. In addition, the student can explain application of unit processes and can describe their operational principles.

Contents:

Fluid mechanics, fluid transfer, mixing, properties affecting storage and transportation of granular material, storing of granular material, transportation of solid materials, mechanical conveyors, pneumatic and hydraulic transport, fluidization.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures and exercises.

Target group:

Bachelor students in process engineering

Prerequisites and co-requisites:

477101A Particle Technology

Recommended optional programme components:

-

Recommended or required reading:

Lecture materials and other materials that will be announced at the lectures.

Assessment methods and criteria:

Exam.
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:

Education coordinator

Working life cooperation:

No

Other information:

Literature exam possible for foreign students.

477203A: Process Design, 5 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Jani Kangas
Opintokohteen kielet: English
Leikkaavuudet:

480310A	Fundamentals of Process Design	5.0 op

ECTS Credits:

5 cr

Language of instruction:

English

Timing:

Periods 4-5.

Learning outcomes:

By completing the course the student is able to identify the activities of process design and the know-how needed at different design stages. The student can utilise process synthesis and analysis tools for creating a preliminary process concept and point out the techno-economical performance based on holistic criteria.

Contents:

Acting in process design projects, safety and environmentally conscious process design. Design tasks from conceptual design to plant design, especially the methodology for basic and plant design.

Mode of delivery:

Lectures and design group exercises.

Learning activities and teaching methods:

Lectures 30h, group work 50h and self-study 50h

Target group:

Bachelor students in DPEE

Prerequisites and co-requisites:

Objectives of 477202A Reactor analysis, 477304A Separation processes and 477012 Introduction to Automation Engineering

Recommended optional programme components:

-

Recommended or required reading:

Lecture handout, Seider, W.D., Seider, J.D. and Lewin, D.R. Product and process design principles: Synthesis, analysis and evaluation. John Wiley & Sons, 2004. (Parts) ISBN 0-471-21663-1

Assessment methods and criteria:

Combination of examination and design group exercises.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Scale 1-5

Person responsible:

University Teacher Jani Kangas

Working life cooperation:

-

Other information:

-

A432121: Module Preparing for the Option, Module 1, 20 - 40 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Module Preparing for the Option
Laji: Study module
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Compulsory

555221P: Introduction to Production, 2 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Basic Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Auvinen, Aila Irmeli
Opintokohteen kielet: Finnish
Leikkaavuudet:

555225P Basics of industrial engineering and management 5.0 op

ECTS Credits:

2 ECTS credits.

Language of instruction:

Finnish

Timing:

Period 4.

Learning outcomes:

The objective of the course is to familiarise a student to the concepts and theories that aim to explain and predict the design and operation of production systems. After the course a student should be able to explain the basic concepts of the production and view the decisions related to production systems in different situations, explain the stages of the investment process, solve some basic calculations, make design tasks and evaluate them, and describe the economic and administrative instruments of environmental law related to an enterprise.

Contents:

Operations strategy, service operations, process design and improvement, process choices and production layout, capacity management, facility location.

Mode of delivery:

Face-to-face learning.

Learning activities and teaching methods:

Lectures and exercises.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

555220P Basic course in industrial engineering and management, 555280P Basic course of project management.

Recommended optional programme components:

-

Recommended or required reading:

Krajewski, L. J., Ritzman L. P. & Malhotra M.K. 2007. Operations management: processes and value chains. 8. p. Upper Saddle River (NJ), Pearson Prentice Hall. Chapters: 1. Operations as a Competitive Weapon, 2. Operations Strategy, 4. Process Strategy, 5. Process Analysis, 7. Constraint Management, 8. Process Layout, 11. Location, and Supplements A: Decision Making and J: Financial Analysis.

Assessment methods and criteria:

Exam and the homework.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

1-5.

Person responsible:

Lecturer Aila Auvinen

Working life cooperation:

No.

Other information:

The lectures and weekly exercises are held in Finnish. The English exam is based only on the written material mentioned in study materials. Please, contact the person responsible for the course.

555260P: Basic Course in Occupational Safety and Wellbeing at Work, 3 op

Opiskelumuoto: Basic Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Henri Jounila, Seppo Väyrynen

Opintokohteen kielet: Finnish

Leikkaavuudet:

555265P Occupational Safety and Health Management 5.0 op

ay555260P Basic Course in Occupational Safety and Wellbeing at Work (OPEN UNI) 3.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

3 ECTS credits.

Language of instruction:

Finnish.

Timing:

The course unit is held in the spring semester, during Periods 5 and 6.

Learning outcomes:

After the course the student is capable of explaining basic terms of work envi-ronment. He is able to assess the importance of occupational safety, health and well-being at work. In addition, he is able to assess the significance of occupational safety in the improving of productivity and quality.

Contents:

Students will acquire knowledge and practical skills which they will be able to utilize and integrate on ordinary engineering practice. Work accidents and occupational diseases, safety promo-tion, occupational health, ergonomics development, and organising principles in modern production systems and in other work environments.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 20 h. The exercises are completed as group work.

Target group:

-

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Työsuojelun perusteet. Työterveyslaitos 2009, ISBN: 978-951-802-916-1. Other literature reported at the beginning of the course. As an exercise material: Pienyrityksen työympäristö tuloksen tekijänä 2012, Työsuojeluoppaita ja -ohjeita 5, Työsuojeluhallinto, ISBN 978-952-479-049-9.

Assessment methods and criteria:

Exam and exercises.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

1-5

Person responsible:

Henri Jounila

Working life cooperation:

No

Other information:

-

555220P: Basic Course in Industrial Engineering and Management, 3 op

Opiskelumuoto: Basic Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Auvinen, Aila Irmeli

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

3,0 - 4,5 ECTS credits.

Language of instruction:

Finnish.

Timing:

Periods 1-4.

Learning outcomes:

The objective of the course is to familiarise a student to industrial activities, to operations of an enterprise as well as to the factors affecting the success of an enterprise. Upon completion the student should be able to describe IEM as a science and a profession, describe basic systemic models of an enterprise, describe basic concepts of microeconometrics, and calculate basic calculations of microeconometrics.

Contents:

Production and operations, systemic models of an organization, basic calculations of microeconometrics.

Mode of delivery:

Face-to-face learning.

Learning activities and teaching methods:

Lectures and exercises are held during the periods 1 - 3.

Target group:

-

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Applicable parts of the book Uusi-Rauva, E., Haverila, M., Kouri, I. & Miettinen, A. 2005. Teollisuustalous. 5. p. Ylöjärvi. Infacs Johtamistekniikka. Some other material in Business Economics is defined by a student and the person responsible for the course.

Assessment methods and criteria:

Exam and the homework.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

1-5.

Person responsible:

Lecturer Aila Auvinen

Working life cooperation:

No.

Other information:

The lectures and weekly exercises are held in Finnish. The English examination is based only on written material **.** Please, contact the person responsible for the course and ask the study material and the exam for you.

555280P: Basic Course of Project Management, 2 op

Opiskelumuoto: Basic Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Jaakko Kujala

Opintokohteen kielet: Finnish

Leikkaavuudet:

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

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

2 ECTS credits.

Language of instruction:

Finnish

Timing:

Periods 1-3.

Learning outcomes:

Upon completion the student can explain the essential concepts related to project management. He/she can present the main features of a project plan and can use different methods of partitioning a project. The student can also schedule a project and estimate its costs. The student can explain the terms related to Earned value method and can apply the method on simple tasks. Upon completion the student recognizes the essential tasks of project risk management.

Contents:

Defining project management, project planning, organising and scope management, schedule management, cost management, earned value calculation and project risk management.

Mode of delivery:

Face-to-face learning.

Learning activities and teaching methods:

Lectures, weekly assignments and exercise book. The final grade is derived from the course exam.

Target group:

-

Prerequisites and co-requisites:

None.

Recommended optional programme components:

-

Recommended or required reading:

Lecture material, exercise book. Artto, Martinsuo & Kujala 2006. Projektiliiketoiminta. WSOY, ISBN: 951-0-31482-X (applicable sections), available at http://pbgroup.aalto.fi/en/the_book_and_the_glossary/.

Assessment methods and criteria:

Week assignments and final exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

1-5

Person responsible:

Professor Jaakko Kujala.

Working life cooperation:

No

488309A: Biocatalysis, 5 op

Voimassaolo: 01.08.2013 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

488212A	Fundamentals of catalysis	5.0 op
488308A	Enzyme Technology	2.0 op
488301A	Microbiology	3.0 op

ECTS Credits:

5 cr

Language of instruction:

Finnish

Timing:

The course is held in autumn semester during periods II and III. It is recommended to complete the course in the 2 th year.

Learning outcomes:

After completing this course, the student will be able to define what biocatalysts are. Student is able to describe in which way different microbes and enzymes can be applied as biocatalysts and can give examples how biocatalysts are applied. The student will be able to evaluate the cultivation and growth of microbes and the use of them in the production of different products. 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. Student will be able to judge how microbes and enzymes could be applied in industry.

Contents:

Microbes and enzymes as biocatalysts and the use of them in industry. The structural and functional characteristics, metabolism, products from metabolism, physiology, and growth of prokaryotic and eukaryotic cells from industrial point of view. The structure and function of enzymes, enzymatic reactions and kinetics.

Mode of delivery:

Blended teaching.

Learning activities and teaching methods:

Lectures 40 h/ group work 40 h/web-based teaching 10h/ self-study 40 h.

Target group:

Bachelor students for environmental engineering.

Prerequisites and co-requisites:

Course 477011P Introduction to process and environmental engineering I or respective knowledge of microbiology and biotechnology.

Recommended optional programme components:

-

Recommended or required reading:

Lecture hand out; Madigan MT, Martinko JM & 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;other material announced in the lectures.

Assessment methods and criteria:

Lectures, intermediate exams (välikokeet) or final examination and group work. Grade will be composed of group work and intermediate exams (välikokeet) or final examination.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

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

Person responsible:

University teacher Johanna Panula-Perälä

Working life cooperation:

No

Other information:

-

488302A: Basics of Biotechnology, 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Johanna Panula-Perälä

Opintokohteen kielet: English

Leikkaavuudet:

488052A	Introduction to Bioproduct and Bioprocess engineering	5.0 op
480430A	Bioprocesses I	5.0 op

ECTS Credits:

5 cr

Language of instruction:

English

Timing:

The course is held in spring semester during periods IV and V. It is recommended to complete the course in the 3 rd year.

Learning outcomes:

After completing this course, the student will be able to explain how the modern biotechnology can be applied in the food, pharma- and material industries, in the mining industry and environmental biotechnology, for example, in the production of alcoholic beverages and biofuels, antibiotics and other drugs, in metal manufacturing, and in biological degradation.

Contents:

Industrial biotechnology. Food biotechnology: Production of beer and alcoholic beverages; Biotechnology in dairy industry. Biotechnology in the mining and materials industries. Biorefineries. Biotechnology in forest industry. Biopolymer engineering. Environmental Biotechnology: Biodegradation; Bioremediation. Pharmaceutical biotechnology: Production of antibiotics and therapeutic proteins.

Mode of delivery:

Blended teaching.

Learning activities and teaching methods:

Lectures 32 h/ group work and seminar presentation 50 h/ self-study 50 h.

Target group:

Bachelor students in process engineering and environmental engineering, students in M.Sc. Programme in Green Chemistry and Bioproduction, and in Master’s degree programme in Biomass, Technology and Management.

Prerequisites and co-requisites:

Courses 488301A Microbiology and 488308S Enzyme technology for students started 2011, or respective knowledge of microbiology and biocatalysis.

Recommended optional programme components:

-

Recommended or required reading:

Will be announced at the lectures. Supplementary material: Aittomäki E ym.: BioProsessitekniikka. WSOY 2002. 951-26995-6; Salkinoja-Salonen M (toim.): Mikrobiologian perusteita. Helsingin yliopisto, 2002. 951-45-9502-5.

Assessment methods and criteria:

Lectures, intermediate exams and/or final exam, group work and seminar. Grade will be composed of lecture exams and/or final exam, group work and seminar.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

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

Person responsible:

University teacher Johanna Panula-Perälä

Working life cooperation:

No

488012A: Environmental Legislation, 5 op

Voimassaolo: 01.01.2011 - 31.07.2017
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Pekka Rossi
Opintokohteen kielet: English
Leikkaavuudet:

488101A	Environmental Legislation	5.0 op

ECTS Credits:

5 cr

Language of instruction:

Finnish

Timing:

The course unit is held in the spring semester, during periods 4-5

Learning outcomes:

Upon completion of the course, the student will be able to explain the main component of Finnish environmental legislation and knows the structure of environmental administration in governmental and municipal level; authorities, jurisdiction and duties. The student will be able to understand differences between EIA and environmental permits. Having completed the course, the student knows what permits and acts must be considered in different cases relating to mining, water and energy initiatives.

Contents:

Environmental Legislation of Finland

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 11 h, seimar 9 h and self-study 115 h. Totally 135 h.

Target group:

Students in bachelor program of environmental engineering

Prerequisites and co-requisites:

No

Recommended optional programme components:

-

Recommended or required reading:

Ympäristöoikeuden pääpiirteet (Ekroos, Kumpula 2010, ISBN: 9789510361283), lecture notes

Assessment methods and criteria:

Group work (50% of the final grade of the course) and seminar (50%). Seminar includes presentation and discussion.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

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

Person responsible:

University Lecturer A-K Ronkanen

Working life cooperation:

No

Other information:

-

488115S: Geomechanics, 5 op

Opiskelumuoto: Advanced Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Kauko Kujala
Opintokohteen kielet: Finnish
Leikkaavuudet:

480211A Advanced Course in Environmental Geotechnics 5.0 op

ECTS Credits:

5 cr

Language of instruction:

Finnish

Timing:

The course unit is held in the autumn semester, during periods 3-4

Learning outcomes:

Have a clear understanding of mechanical behaviour of soil structures in loading and environmental conditions. Understand design and dimensioning principles and can explain environmental aspects of soil behaviour.

Contents:

Origins and composition of soils, classification of soils, stress and strains in soils, mechanical properties of soils, stability of slopes, bearing capacity of foundation, seepage analyses, freezing and thawing of soils, site investigations and in situ testing.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures, calculation and design exercises

Target group:

Students in Master program of environmental engineering

Prerequisites and co-requisites:

No

Recommended optional programme components:

488121S Introduction to Civil Engineering

Recommended or required reading:

Lecture handout and other materials delivered in lectures

Assessment methods and criteria:

Examination and homeworks
Read more about assessment criteria at the University of Oulu webpage.

Grading:

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

Person responsible:

Professor Kauko Kujala

Working life cooperation:

No

488104A: Industrial and municipal waste management, 5 op

Voimassaolo: 01.08.2005 - 31.07.2017

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Elisangela Heiderscheidt

Opintokohteen kielet: English

Leikkaavuudet:

480160S Waste Management of Communities and Industry 5.0 op

ECTS Credits:

5 cr

Language of instruction:

English

Timing:

The course unit is held in the spring semester, during periods 5-6

Learning outcomes:

The student will acquire a wilder view of what is waste and how it is generated and managed in communities and industries. Student will be familiar with waste management hierarchy and how waste legislation regulates waste management. She/he will get basic knowledge about waste treatment methods including their sustainability and related environmental impacts. As well as, how a series of factors influence the planning of waste management activities in industries and municipalities. The student will also be able to understand the energy and material recovery potential within the waste sector.

Contents:

Waste management hierarch, waste prevention principle, municipal waste management, waste management in industries, waste legislation, municipal and industrial waste treatment methods, international treaties related to waste management (Basel convention and Clean Development Mechanism projects: carbon trading), waste to energy principle.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Learning methods: A) Active learning method: Lectures (24 h), group work (45 h), self-study for examination (55,5 h) and field visits (8 h) or alternatively B) Group work (45 h), self-study for examination (87,5 h).

Target group:

Students in bachelor program of environmental engineering

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Lecture hand-outs, notes and other materials delivered in lectures. Waste management: a reference handbook illustrated edition, 2008 (electronic book, ISBN 9781598841510).

Assessment methods and criteria:

The students' performance during the course is assessed by successful completion of stages A and B as follow: A) Completion of the course work which consists of group exercises 1 and 2 each carrying 30% weight in the course final grade; B) Course examination carrying 40% weight in the course final grade (Note that a passing grade (1-5) for the course examination is required for the completion of the course). 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:

Reseacher Elisangela Heiderschedt

Working life cooperation:

No

Other information:

-

477304A: Separation Processes, 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Muurinen, Esa Ilmari, Ainassaari, Kaisu Maritta

Opintokohteen kielet: Finnish

Leikkaavuudet:

470323A	Separation Processes	5.0 op

ECTS Credits:

5 cr

Language of instruction:

Finnish, can be completed in English as a book examination.

Timing:

Implementation in autumn semester during 1 st and 2 nd periods.

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.

Mode of delivery:

Lectures including exercises.

Learning activities and teaching methods:

Lectures 40 h, exercises 20 h and homework 16 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:

Courses 477301A Momentum Transfer, 477302A Heat Transfer and 477303A Mass 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:

King, C.J.: Separation Processes, McGraw-Hill, 1980, 850 p.; Noble, R.D. & Terry, P.A.: Principles of Chemical Separations with Environmental Applications. Cambridge 2004, Cambridge University Press, 321 p.
Additional literature: Henley, E.S. &Seader, J.D.: Equilibrium Stage Separation Operations in Chemical Engineering, John Wiley & Sons, 1981, 742 p.; McCabe, W.L. et al.: Unit Operations of Chemical Engineering, 5th ed., McGraw-Hill, 1993, 1130 p.; Rousseau, R.W.: Handbook of Separation Process Technology, John Wiley & Sons, 1987, 1010 p.

Assessment methods and criteria:

Homework assignments affect the course grade. Examination.
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 Riitta Keiski

Working life cooperation:

No

Other information:

-

A432122: Module Preparing for the Option, Module 2, 19,5 - 20,5 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Module Preparing for the Option
Laji: Study module
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Compulsory

477033A: Programming in Matlab, 2,5 op

Voimassaolo: 01.01.2009 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Juha Pentti Jaako
Opintokohteen kielet: Finnish
Leikkaavuudet:

488051A	AutoCAD and Matlab in Process and Environmental Engineering	5.0 op

ECTS Credits:

2,5 cr

Language of instruction:

Finnish

Timing:

Course unit is arranged twice a year: autumn semester (1st period) and spring semester (5th period). Recommended for second year B.Sc. students.

Learning outcomes:

Student can use Matlab in solving simple computational problems.

Contents:

Matlab as a computational tool, Graphics in Matlab, Programming in Matlab, Solution of computational problems in Matlab, Matlab debugging

Mode of delivery:

Tuition is implemented as face-to-face teaching and blended teaching (web-based teaching + face-to-face teaching).

Learning activities and teaching methods:

The amount of guided teaching is 20 hrs and for self-study there are 46.7 hrs allocated.
Contact teaching includes, depending on situation, lectures, group work and tutored group work. During self-study time student does independent work or group work.

Target group:

B.Sc. students in process and environmental engineering programmes.

Prerequisites and co-requisites:

-

Recommended optional programme components:

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Recommended or required reading:

Heath, M.T. (2002) Scientific computing – An introductory survey. 2nd edition. McGraw-Hill. ISBN 007-124489-1.; Kiusalaas, J. (2005) Numerical methods in engineering with Matlab. Cambridge University Press. ISBN 978-0-511-12811-0.;
Matlab tutorials.

Assessment methods and criteria:

This course unit uses continuous assessment. There are 4 home work. Deadlines are observed. The assessment of the course is based on the learning outcomes of the course.
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:

D.Sc. Juha Jaako, lecturer

Working life cooperation:

No

Other information:

-

477032A: AutoCAD in Process and Environmental Engineering, 2 op

Voimassaolo: 01.09.2008 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Pekka Rossi

Opintokohteen kielet: Finnish

Leikkaavuudet:

488051A	AutoCAD and Matlab in Process and Environmental Engineering	5.0 op

ECTS Credits:

2 cr

Language of instruction:

Finnish

Timing:

The course unit is held in the autumn semester, during periods 2-3

Learning outcomes:

Upon completion of the course, the student will have readiness to use AutoCAD-program in different planning assignments of process and environmental engineering.

Contents:

Properties of AutoCAD program, planning exercises (e.g. process flow chart, map planning, instrumentation layout).

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Computer class lectures (36 h), exercises (36 h).

Target group:

Students in bachelor program of environmental engineering

Prerequisites and co-requisites:

No

Recommended optional programme components:

-

Recommended or required reading:

Lecture notes.

Assessment methods and criteria:

Continuous evaluation of exercises.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Pass/fail.

Person responsible:

Researcher Pekka Rossi

Working life cooperation:

No

Other information:

-

031044A: Mathematical Methods, 4 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Mathematics Division
Arvostelu: 1 - 5, pass, fail
Opettajat: Jukka Kemppainen
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

477601A: Process Automation Systems, 4 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Hiltunen, Jukka Antero, Harri Aaltonen

Opintokohteen kielet: Finnish

Leikkaavuudet:

477051A	Automation Engineering	5.0 op
470445S	Digital Process Automation	4.0 op

ECTS Credits:

4 cr

Language of instruction:

Finnish

Timing:

Period 1

Learning outcomes:

Students learn how to use automation systems and PLCs in design, implementation and commissioning projects. Students can configure and program the basic automation functions in DCSs and PLCs.

Contents:

The operational and structural descriptions and concepts of process automation, automation commissioning projects, configuration tools for automation functions, logic programming, telecommunication technology in automation, field buses, examples of commercial DCSs, PLCs and field bus systems.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

lectures, demonstrations, configuration and logic programming exercises, excursion to a neighbouring industrial plant

Target group:

B.Sc. students in process and environmental engineering

Prerequisites and co-requisites:

477011P Introduction to process and environmental engineering I and 4770xxP Introduction to process and environmental engineering II are recommended

Recommended optional programme components:

-

Recommended or required reading:

lecture notes and handouts, manuals/handbooks

Assessment methods and criteria:

Learning diary or examination.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

numerical grading scale 1-5 or fail

Person responsible:

Lecturer Jukka Hiltunen and Ph.D. student Harri Aaltonen

Working life cooperation:

No

Other information:

-

477501A: Process dynamics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Leiviskä, Kauko Johannes

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay477501A Process Control Engineering I 5.0 op

470431A Process Control Engineering I 5.0 op

ECTS Credits:

5 cr

Language of instruction:

Finnish/English

Timing:

Implementation in 3 rd period.

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, distillation columns and heat exchangers. Modelling of larger processes.

Learning activities and teaching methods:

Lectures during one period

Target group:

Bachelor's students in DPEE

Prerequisites and co-requisites:

Courses Material and Energy Balances, Heat Transfer, Mass Transfer and Control System Analysis recommended beforehand.

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.; Yang, W.J., Masubuchi, M.: Dynamic Process and System Control. Gorden and Breach Science Publishers, New York 1970. 448 s.

Assessment methods and criteria:

Home work and written/oral test.
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 Kauko Leiviskä

Working life cooperation:

No

Other information:

-

488001A: Practical Training, 3 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Intermediate Studies

Laji: Practical training

Arvostelu: 1 - 5, pass, fail

Opettajat: Saara Luhtaanmäki

Opintokohteen kielet: Finnish

Leikkaavuudet:

477004A	Practical Training	5.0 op
480099A	Industrial Training Period (practice)	7.0 op

ECTS Credits:

3 cr

Language of instruction:

Finnish or English

Timing:

Student usually works in summer time.

Learning outcomes:

During the practical training the student is exposed to his/her working environment from the point of view of his/her studies and becomes acquainted with one of the possible jobs of the future. The student can name the problems associated with the working environment and can propose improvements. The student will experience points of contact between working life and the studies.

Contents:

Suitable areas for practical training are, for example, regional environment centers, environmental engineering and consulting offices, water-works, biotechnological and food industry, chemical industry, pulp and paper industry, metallurgical and mining industry, partly electronics and automation industry, and other areas in the private and public sectors.

Mode of delivery:

Working as employee

Learning activities and teaching methods:

-

Target group:

Bachelor’s students in DPEE

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Student has to show original references and leave the application and report to student advisor. In reference must be training time period and duties.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Verbal scale Passed/Failed

Person responsible:

Student advisor Saara Luhtaanmäki

Working life cooperation:

Yes.

Other information:

The objective is to give an overview of the areas where the student will possibly work after graduation. Practical training nurtures theoretical study. In addition the training should give the student a general idea

about the company and its technical and organizational operations, financial management and supervision. Training is usually offered in a position of an employee so that the student gets familiar with practical work and safety at work as well as with social nature in working environment. Students will land the jobs themselves.

A432146: Supplementary Module/Bachelor's Degree, 10 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Supplementary Module / Bachelor's Degree

Laji: Study module

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

E

030005P: Information Skills, 1 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Faculty of Technology

Arvostelu: 1 - 5, pass, fail

Opettajat: Sassali, Jani Henrik, Koivuniemi, Mirja-Liisa

Opintokohteen kielet: Finnish

Leikkaavuudet:

030004P	Introduction to Information Retrieval	0.0 op

ECTS Credits:

1 ECTS credit

Language of instruction:

Finnish

Timing:

2nd or 3rd year

Learning outcomes:

Students know the different phases of information retrieval process and basic techniques of scientific information retrieval. They will find the most important reference databases of their discipline and know how to evaluate information sources and retrieval results.

Contents:

Retrieval of scientific information, the retrieval process, key databases of the discipline, and evaluation of information retrieval and information sources.

Mode of delivery:

Blended teaching: classroom training, web-based learning material and exercises in Optima environment, a final assignment on a topic of the student’s own choice

Learning activities and teaching methods:

Training sessions 8h, group working 7h, self-study 12h

Target group:

Compulsory for all students of the Faculty of Technology. In the Faculty of Science the course is compulsory for students of biology, physics, geosciences, chemistry, geography and information processing science. The course is optional for students of biochemistry and mathematics.

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Web learning material https://wiki.oulu.fi/display/030005P.

Assessment methods and criteria:

Passing the course requires participation in the training sessions and successful completion of the course assignments.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

pass/fail

Person responsible:

Science and Technology Library Tellus, tellustieto (at) oulu.fi

Working life cooperation:

-

Other information:

-

477000P: Planning of Studies and Career, 1 op

Voimassaolo: 01.08.2013 -
Opiskelumuoto: Basic Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Saara Luhtaanmäki
Opintokohteen kielet: Finnish
Leikkaavuudet:

030001P	Orientation Course for New Students	1.0 op

ECTS Credits:

1 cr

Language of instruction:

Finnish

Timing:

The course unit is held in the autumn semester, during periods I, II and III.

Learning outcomes:

The aim of the course is to introduce new students to the university, academic studies, the department and the studies of his/her degree programme in the faculty of Technlogy.

Contents:

Issues related to the beginning of the studies. Goals, structure and contents of the studies in the Faculty of Technology. Preparing a personal study plan. Study technique and the library.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Tutorials, information days organized by the faculty and by the degree programmes, independent studying, total 20 h.

Target group:

All first year students in DPEE

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Study guide.

Assessment methods and criteria:

Participation to the tutorials and information sessions and doing the personal study plan.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Verbal scale Passed/Failed

Person responsible:

Student advisor Saara Luhtaanmäki

Working life cooperation:

No.

Other information:

-

901008P: Second Official Language (Swedish), 2 op

Voimassaolo: 01.08.1995 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Language Centre
Opintokohteen kielet: Swedish
Leikkaavuudet:

ay901008P	Second Official Language (Swedish) (OPEN UNI)	2.0 op

Proficiency level:

B1/B2/C1 (Common European Framework of Reference)

Status:

This course is compulsory to all students except those who have at least 60 ECTS credits of Swedish studies in their degrees. The language proficiency provided by the course unit is equivalent to the language proficiency required of a state official with an academic degree working in a bilingual municipality area (Act 424/03 and Decree 481/03).
According to the requirements of the law, the student must be able to use Swedish both orally and in writing in various professional situations. Achieving this kind of proficiency during a course unit that lasts for only one semester requires that the student has already achieved the necessary starting proficiency level prior to taking the course.

Required proficiency level:

The required starting proficiency level for students of all faculties is a grade of 7 or higher from the Swedish studies at secondary school (B-syllabus) or equivalent knowledge AND a passing grade from the proficiency test held at the beginning of the course unit. Based on this proficiency test the students are directed to brush up on their language skills if it is deemed necessary; mastering basic vocabulary and grammar is a prerequisite to achieving the necessary language proficiency for the various communication situations one faces in professional life.
If a student has not completed Swedish studies (B-language) at secondary school with a grade of 7 or higher, or his/her language skills are otherwise lacking, he/she must achieve the required proficiency level BEFORE taking this compulsory Swedish course.

ECTS Credits:

2 ECTS credits

Language of instruction:

Swedish

Timing:

Students of Architecture: autumn semester of the first year of studies.
Students of Electrical Engineering and Computer Science and Engineering: autumn or spring semester of the first year of studies.

Students of Industrial Engineering and Management and Environmental Engineering: autumn semester of the 2nd year of studies
Students of Process Engineering and Mechanical Engineering: autumn or spring semester of the third year of studies.

Learning outcomes:

Upon completion of the course unit the student should be able to read and understand texts from his/her academic field and make conclusions based on them. The student should be able to write typical professional emails and short reports. He/she should be able to carry himself/herself according to Swedish etiquette when acting as host or guest. The student should also be able to discuss current events and special field-specific matters, use the vocabulary of education and plan and give short oral presentations relating to his/her own field.

Contents:

Communicative oral and written exercises, which aim to develop the student's Swedish proficiency in areas relevant to his/her academic field and future professional tasks. The student practises oral presentation and pronunciation. Situational exercises done individually and in pairs and groups. Discussions in small groups. Current texts about the student's special field. Written exercises relating to the student's professional field. Practising presentation skills.

Mode of delivery:

Contact teaching

Learning activities and teaching methods:

1 x 90 minutes of contact teaching per week and self-directed study, 52 hours per course.

Target group:

See Timing

Prerequisites and co-requisites:

See Required Proficiency Level

Recommended optional programme components:

-

Recommended or required reading:

Study material subject to a charge will be provided by the teacher.

Assessment methods and criteria:

The course unit focuses on improving both oral and written language skills and requires active attendance and participation in exercises, which also require preparation time. 100% attendance is required. The course unit tests both oral and written language skills.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Oral and written language proficiencies are tested separately and assessed using the so called KORU-criteria (publication of HAMK University of Applied Sciences, 2006). Separate grades will be awarded for the successful completions of both oral and written portions of the course unit: the possible passing grades are **satisfactory skills and good skills** (see language decree 481/03). The grades are based on continuous assessment and testing.

Person responsible:

See contact teachers on the Language and Communication home page www.oulu.fi/kielikoulutus

Working life cooperation:

-

Other information:

Students sign up for teaching in WebOodi. A student can only sign up for one teaching group. When signing up , it is imperative that the student fills in his/her university email address (paju.oulu.fi), major subject and Swedish grades attained during secondary education in the Further Information field. Information in sign-up periods and course unit timetables can be found in WebOodi.

900009P: Second Official Language (Finnish), 2 op

Voimassaolo: 01.08.1995 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Language Centre

Opintokohteen kielet: Finnish

Proficiency level:

B1/B2/C2

Status:

This course is compulsory to students who received their schooling in Swedish.
The language proficiency provided by the course unit is equivalent to the language proficiency required of a state official with an academic degree working in a bilingual municipality area (Act 424/03 and Decree 481 /03).

Required proficiency level:

Successful completion of the A-syllabus in Finnish (A-finska) during secondary education or equivalent knowledge.

ECTS Credits:

3 credits

Language of instruction:

-

Timing:

Second year of studies

Learning outcomes:

Upon completion of the course the student should have attained the required proficiency level in Finnish to be able to function in his/her studies and professional work tasks. The student should be able to manage in various oral communication situations, read literature from his/her academic field and write fluent texts about his/her special field. The student should also be able to understand standard spoken Finnish as well as Finnish of his/her own special field.
The language proficiency provided by the course unit is equivalent to the language proficiency required of a state official with an academic degree working in a bilingual municipality area (Act 424/03 and Decree 481 /03).

Contents:

Taking the course exam and participating in the teaching, if necessary.

Mode of delivery:

Contact teaching

Learning activities and teaching methods:

The course exam consists of a written section (4 hours) and an oral section (1 hour). 60 hours of contact teaching is arranged for students who fail the exam. Active and regular participation in the teaching is required.

Target group:

Students in the Faculty of Technology who received their schooling in Swedish.

Prerequisites and co-requisites:

Successful completion of the A-syllabus in Finnish (A-finska) during secondary education or equivalent knowledge.

Recommended optional programme components:

-

Recommended or required reading:

To be agreed on.

Assessment methods and criteria:

This course is usually completed by taking the course exam held by the Language Centre. The exam tests the student's Finnish language skills: written and oral text production, reading and listening comprehension and special field-specific language skills. Students who fail the exam may attend Finnish language teaching, after which they must retake and pass the exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Separate grades are given for written and oral language skills: the possible passing grades are satisfactory skills and good skills. Satisfactory skills equal B1 proficiency and good skills equal B2 proficiency or higher in the Common European Framework of Reference for Languages (CEFR).

Person responsible:

Anne Koskela

Working life cooperation:

-

Other information:

The written exam is held during the autumn semester. Students sign up for the exam in WebOodi. The date of the oral exam is agreed upon separately. Students must bring a copy of their matriculation examination certificate with them when they come to the exam. If they have completed the Central Government's language proficiency exam, they must bring a copy of that certificate with them as well.

You can choose also another language than English.

902011P: Technical English 3, 6 op

Voimassaolo: 01.08.1995 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Language Centre
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: English

Proficiency level:

CEFR B2 - C1

Status:

This course is compulsory for the students who have chosen English as their foreign language. (See the foreign language requirements for your own degree programme.)

Required proficiency level:

English must have been the A1 or A2 language at school or equivalent English skills acquired otherwise. If you need to take English, but lack this background, please get in touch with the Languages and Communication contact teacher for your department to discuss individual solutions.

ECTS Credits:

6 ECTS credits (The workload is 160 hours.)
STUDENTS OF ENGINEERING: The course consists of 3 x 2-ECTS modules.
STUDENTS OF ARCHITECTURE: The course consists of 2 x 3-ECTS modules.
Students with the matriculation exam grade *Laudatur* or *Eximia cum laude approbatur* will be exempted from part of the course (2 ECTS credits).

Language of instruction:

English

Timing:

STUDENTS OF ENGINEERING:
PYO, KO, TuTa: *1st & 2nd* years of studies, beginning 1st year autumn.
SO & CSE: 2nd & 3rd years of studies, beginning 2nd year autumn.
STUDENTS OF ARCHITECTURE:
1st & 2nd years of studies, beginning 1st year spring and continuing 2nd year autumn.

Learning outcomes:

By the end of the course, you will be able to

- demonstrate efficient strategies and methods for developing and maintaining your English proficiency
- communicate using the core vocabulary required for professional language use in your field
- apply language skills, intercultural awareness and presentation techniques necessary for working in a multicultural environment

- use language, culture and communication skills at a B2-C1 CEFR level in accordance with your own professional needs.

Contents:

In this course, you will focus on developing oral and written English language skills which enable you to follow developments in your own professional field and manage successfully in an international, intercultural working environment.

STUDENTS OF ENGINEERING:
The course consists of three modules:

1. first, **Professional English for Technology** (PET, 2 ECTS credits),
2. then **two modules** (2 ECTS credits each) from a free-choice module menu, in which each module has its own content. These modules allow you to develop further skills in specific core areas. Read the module descriptions with care so that you choose modules which match your own needs, interests and level.

   TuTa students, however, take ONE module from the free-choice menu and then, in second year autumn, the Business Plan module, which is integrated with a course in their own department (*555222A Tuotantotalouden harjoitustyöt*) .

STUDENTS OF ARCHITECTURE:
The course consists of two modules:
See the course description of each module (902011P-38 module A and 902011P-39 module B for a detailed explanation of the course content.

Mode of delivery:

STUDENTS OF ENGINEERING: The mode of delivery varies according to the modules you take. See the course descriptions for the individual modules.
STUDENTS OF ARCHITECTURE: face-to-face teaching in the premises of your own department and independent study

Learning activities and teaching methods:

STUDENTS OF ENGINEERING: The teaching methods and learning activities depend on which free-choice modules you choose. See the course descriptions for the individual modules.
STUDENTS OF ARCHITECTURE:
The classroom teaching comprises about 50% of the total student workload for the course and includes mini-lectures, group and teamwork, student presentations. The independent work component comprises online work and independent study in preparation for classroom activities.

Target group:

Students of the Faculty of Technology
- all Engineering Departments
- the Department of Architecture

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Materials will be provided by the teacher and a copy fee will be charged where applicable.

Assessment methods and criteria:

Assessment methods vary according to the individual modules taken. The assessment criteria are based on the learning outcomes of the module.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

pass / fail.

Person responsible:

Each department in the Technical Faculty has its own Languages and Communication contact teacher for questions about English studies.

Working life cooperation:

-

Other information:

See the Languages and Communication Study Guide, English, TTK.

903012P: Technical German 3, 6 op

Voimassaolo: 01.08.1995 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Language Centre
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: German

Ei opintojaksokuvauksia.

488990A: Bachelor's Thesis / Enviromental Engineering, 8 op

Voimassaolo: 01.08.2007 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

477990A	Bachelor's Thesis / Process Engineering	8.0 op

Ei opintojaksokuvauksia.

488994A: MaturityTest/Bachelor of Science in Environmental Engineering/Technology, 0 op

Voimassaolo: 16.03.2007 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

900060A: Technical Communication, 2 op

Voimassaolo: 01.08.2005 - 31.07.2021
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Language Centre
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

ay900060A	Technical Communication (OPEN UNI)	2.0 op
470218P	Written and Oral Communication	3.0 op

Proficiency level:
-
Status:
This course unit is compulsory for students of Electrical Engineering, Computer Science, Communications Technologies and Engineering Mechanical Engineering, Process and Environmental Engineering.
Required proficiency level:

-

ECTS Credits:
2 credits
Language of instruction:
Finnish
Timing:
Electrical Engineering, Computer Science and Engineering and Communications Technologies: 2nd year spring term or 3rd year autumn term or 3rd year spring term.
Mechanical Engineering: 3rd year.
Process and Environmental Engineering: 2nd year spring term or 3rd year autumn term.
Learning outcomes:
Upon completion of the course the student should be familiar with the central principles of work and study-related communication, both oral and written, and be able to apply this knowledge in his/her own communication. The student should be able to prepare and give an illustrative and understandable oral presentation on a topic related to his/her own field in a way that suits the audience and the situation. The student should also be able to seek information and report on his/her findings in writing. The student should be able to analyse and assess his/her own writing and the writing of his/her peers. He/she should be able to act in group communication situations in a target-oriented manner. The student should also be able to give and receive constructive criticism.
Contents:
Professional communication skills: team writing, the process of writing and its different stages, distinctive features of formal scientific and professional texts, oral communication, preparing an illustrative presentation, methods of convincing one's audience, giving and receiving constructive criticism, the features of a functioning team, the group process and the roles of team members, negotiations and meeting practices.
Mode of delivery:
Multimodal teaching
Learning activities and teaching methods:
Contact hours ca. 14 h and independent group work or self-study ca. 40 h.
Target group:
Students of the Faculty of Technology
Prerequisites and co-requisites:
-
Recommended optional programme components:
-
Recommended or required reading:
Kauppinen, Anneli & Nummi, Jyrki & Savola, Tea: Tekniikan viestintä: kirjoittamisen ja puhumisen käsikirja (EDITA); Nykänen, Olli: Toimivaa tekstiä: Opas tekniikasta kirjoittaville (TEK) and material in Optima study environment.
Assessment methods and criteria:
Active participation in contact teaching, independent study and completion of given assignments.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Pass / fail
Person responsible:
Kaija Oikarainen
Working life cooperation:
-
Other information:
All students are required to attend the first meeting of the course unit so the work groups can be formed and work started in a timely and efficient manner. When signing up for the course unit, you should keep in mind that completing it requires a responsible attitude and a strong commitment to the work because the teamwork-based exercises rely heavily on the participation and activity of the students.
If the student is involved in the University's student associations or functions in a position of trust in university government, student union administration or Oulun Teekkariyhdistys ry (or in its subordinate guilds), he/she may be relieved of some of the group communication exercises. These compensatory actions must always be agreed upon separately with the course unit's teacher. The student must present an official statement from a person in charge of the governing body or association, which details the student's tasks and involvement with that body or association. Participation that took place over five years ago does not entitle the student to any compensation.

A432225: Module of Option / Basic Module of Clean production, 28 - 31 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Module of the Option

Laji: Study module

Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Compulsory

030008P: Information Skills for foreign degree students, 1 op

Voimassaolo: 01.08.2012 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Faculty of Technology
Arvostelu: 1 - 5, pass, fail
Opettajat: Koivuniemi, Mirja-Liisa, Sassali, Jani Henrik
Opintokohteen kielet: English

ECTS Credits:

1 ECTS credit

Language of instruction:

English

Timing:

The course is held in the spring semester

Learning outcomes:

Students know the different phases of scientific information retrieval process and basic techniques of systematic information search. They will find the most important reference databases of their discipline and know how to evaluate information sources and search results.

Contents:

Retrieval of scientific information, the search process, key databases of the discipline, and evaluation of information retrieval and information sources.

Mode of delivery:

Blended teaching: classroom training, web-based learning material and exercises in Optima environment, a final assignment on a topic of the student's own choice

Learning activities and teaching methods:

Training sessions 8h, self-study 19h

Target group:

The course is intended to degree students of the Faculty of Science and the Faculty of Technology. The course is compulsory for the Master´s Degree Programme (BCBU) in Environmental Engineering (BEE).

Prerequisites and co-requisites:

It is recommended that the student knows the basic services of Oulu University Library. The student can participate in the Library ABC –training (http://www.oulu.fi/library/node/10710).

Recommended optional programme components:

-

Recommended or required reading:

Parts from the following chapters of the Toolbox of Research: https://wiki.oulu.fi/display/tor/1.1+Finding+scientific+information
https://wiki.oulu.fi/display/tor/1.3.1+Evaluation+based+on+academic+publishing

Assessment methods and criteria:

Passing the course requires participation in the training sessions and successful completion of the course assignments.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

pass/fail

Person responsible:

Science and Technology Library Tellus, tellustieto (at) oulu.fi

Working life cooperation:

-

Other information:

-

900017Y: Survival Finnish Course, 2 op

Voimassaolo: 01.08.1995 -
Opiskelumuoto: Language and Communication Studies
Laji: Course
Vastuuyksikkö: Language Centre
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

ay900017Y	Survival Finnish Course (OPEN UNI)	2.0 op

Proficiency level:

A1.1

Status:

-

Required proficiency level:

No previous Finnish studies.

ECTS Credits:

2 ECTS credits

Language of instruction:

Finnish and English

Timing:

-

Learning outcomes:

By the end of the course the student can understand and use some very common everyday expressions and phrases, and s/he can locate informational content in simple texts and messages. The student also knows the basic characteristics of Finnish language and Finnish communication styles.

Contents:

This is an introductory course which aims to help students to cope with the most common everyday situations in Finnish. During the course, students learn some useful everyday phrases, some general features of the vocabulary and grammar, and the main principles of pronunciation.

The topics and communicative situations covered in the course are: general information about the Finnish language, some politeness phrases (how to greet people, thank and apologize), introducing oneself, giving and asking for basic personal information, numbers, some time expressions (how to tell and ask the time, days of the week, time of day), food, drink and asking about prices.

The structures studied are: personal pronouns and their possessive forms, forming affirmative, negative and interrogative sentences, the conjugation of some verbs, the basics of the partitive singular and some local cases for answering the ‘where'-question.

Mode of delivery:

Contact teaching

Learning activities and teaching methods:

Lessons twice a week (24 h) and self study (26 h).

Target group:

International degree and post-graduate degree students of the University.

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Will be provided during the course.

Assessment methods and criteria:

Regular and active participation in the weekly lessons (twice a week), homework assignments and written exam at the end of the course will be observed in assessment.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Grading scale is 1-5.

Person responsible:

Anne Koskela

Working life cooperation:

-

Other information:

Sign-up in WebOodi. The lessons will be held twice a week during a 6-week period.

900013Y: Beginners' Finnish Course 1, 3 op

Voimassaolo: 01.08.1995 -
Opiskelumuoto: Language and Communication Studies
Laji: Course
Vastuuyksikkö: Language Centre
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

ay900013Y	Beginners' Finnish Course 1 (OPEN UNI)	2.0 op

Proficiency level:

A1.2

Status:

-

Required proficiency level:

A1.1, Completion of the Survival Finnish course (900017Y) or the equivalent language skills.

ECTS Credits:

2 ECTS credits

Language of instruction:

As much Finnish as possible; English will be used as a help language.

Timing:

-

Learning outcomes:

By the end of the course the student can understand and use some familiar and common everyday expressions relating to her/himself and everyday situations. S/he can interact in a simple way provided the other person talks slowly and clearly and is willing to help. The student is able to read short simple texts and messages dealing with familiar topics. S/he also deepens her/his understanding of the Finnish language and communication styles.

Contents:

This is lower elementary course which aims to help students to learn communication skills in ordinary everyday situations. During the course, students broaden their vocabulary and knowledge of grammar and principles of pronunciation. They also practise to understand easy Finnish talk about everyday subjects, and reading and writing short and simple texts/messages.

The topics and communicative situations covered in the course are: talking about oneself, one's family, studies and daily routines, as well as asking about these things from other person, expressing opinions, describing people and things, talking about weather and seasons, the names of the months and colours.

The structures studied are: verb types, basics of the change of the consonants k, p and t in verbs and nouns, the genitive and partitive cases, possessive structure, some declension types for nouns (word types) and the basics of the local cases.

Mode of delivery:

Contact teaching

Learning activities and teaching methods:

Lessons twice a week (26 h) and self study (24 h).

Target group:

International degree and post-graduate degree students of the University.

Prerequisites and co-requisites:

Completion of the Survival Finnish Course

Recommended optional programme components:

-

Recommended or required reading:

Gehring, S. & Heinzmann, S.: **Suomen mestari 1** (chapters 3-5)

Assessment methods and criteria:

Regular and active participation in the weekly lessons (twice a week), homework assignments and written exam at the end of the course will be observed in assessment.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Grading scale is 1-5.

Person responsible:

Anne Koskela

Working life cooperation:

-

Other information:

Sign-up in WebOodi. The course will start right after the Survival Finnish course. The lessons will be held twice a week during a 6-week period.

488400A: Orientation to the BEE studies, 0 - 1 op

Voimassaolo: 01.08.2011 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Kirsi *Marita Puikkonen
Opintokohteen kielet: English

ECTS Credits:

0 cr

Language of instruction:

English

Timing:

In periods 1-4 of the first BEE study year.

Learning outcomes:

After completion of the different parts of the orientation, the student is able to recognize his/her own study environment in the University of Oulu and at the department of Process and Environmental Engineering. He /she can make use of the student services of the university. He/she will be able to draft a personal study plan and schedule together with the programme Study Advisor. The student is also able to use the facilities of academic libraries. He/she will be able to access the tools needed for the studies and in every-day-life.

Contents:

Introduction to studies, overview of the services offered by the university, and the student organizations (e. g. academic sports services, student health services); Introduction to the university, faculty and departments in relation to the BEE studies; Introduction to the methods of studying and to the skills in gaining the tools needed for planning of the studies; Overview of library, Optima, etc. services. Other issues based on the needs of the individual students. Compulsory parts: 1. the Orientation Days for all new international students organized by the University of Oulu, containing an one day by the Department. 2. Orientation to the BEE master's degree programme. 3. Participation to student tutoring during the autumn term. 4. Planning of PSP (personal study plan) and study schedule, and ratification of the BEE study option Clean Production or Water and Environment.

Mode of delivery:

Implemented mainly as face-to-face teaching, or possibly by distance learning.

Learning activities and teaching methods:

Lectures, visits, seminars, exercises, etc.

Target group:

The new students of the Master's Degree Programme (BCBU) in Environmental Engineering (BEE) only.

Prerequisites and co-requisites:

For BEE students, admission to the Master's programme, for which minimally a former bachelor's degree is required.

Recommended optional programme components:

The other courses of the Master's phase curriculum so far.

Recommended or required reading:

All materials will be delivered on need-basis (e.g. BEE-study guide book, etc.)

Assessment methods and criteria:

Active participation to all of the different parts of the course; planning the first version of the PSP together with the Study Advisor (compulsory).
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Verbal scale Passed/Failed

Person responsible:

BEE Study Advisor Marita Puikkonen (Department of Process and Environmental Engineering, University of Oulu)

Working life cooperation:

No

Other information:

This course is compulsory, even if no credits can be attained by it.

488002S: Advanced Practical Training, 3 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Advanced Studies

Laji: Practical training

Arvostelu: 1 - 5, pass, fail

Opettajat: Saara Luhtaanmäki

Opintokohteen kielet: Finnish

Leikkaavuudet:

477005S	Advanced Practical Training	5.0 op
480098A	Practice, extension	7.0 op

ECTS Credits:

3 cr

Language of instruction:

Finnish or English

Timing:

Student usually works in summer time.

Learning outcomes:

During the advanced practical training the student is exposed to his/her working environment from the point of view of his/her studies and becomes acquainted with another possible future job or with a different assignment already in a familiar working environment. The student can identify the problems associated with the working environment and can solve them. The student can apply theoretical knowledge in practical tasks. The student identifies the tasks appropriate for the Master of Science in Technology at his/her workplace.

Contents:

Suitable areas for practical training are, for example, regional environment centers, environmental engineering and consulting offices, water-works, biotechnological and food industry, chemical industry, pulp and paper industry, metallurgical and mining industry, partly electronics and automation industry, and other areas in the private and public sectors.

Mode of delivery:

Working as employee

Learning activities and teaching methods:

-

Target group:

Master's students in DPEE

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Student has to show original references and leave the application. In addition she/he has to participate to seminar where she/he reports own summer job. In reference must be training time period and duties. Read more about assessment criteria at the University of Oulu webpage.

Grading:

Verbal scale Passed/Failed

Person responsible:

Student advisor Saara Luhtaanmäki

Working life cooperation:

Yes.

Other information:

The objective is to give a deeper and more detailed conception of the areas where the student will possibly work after graduation. Suitable tasks would be supervision tasks and R&D tasks. Students will land the jobs themselves.

488401A: Introduction to the Barents Region, 2 op

Voimassaolo: 01.01.2009 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Kirsi *Marita Puikkonen

Opintokohteen kielet: English

ECTS Credits:

2 cr

Language of instruction:

English

Timing:

In periods 1-2 of the first BEE study year.

Learning outcomes:

The student will be able to tell where and what the Barents Region is, and describe the main environmental historical, cultural and socio-economic issues related to it including also the special technological and infrastructural factors therein, and evaluate those issues against the respective issues in his/her country of origin.

Contents:

The Barents environment; History of the Barents collaboration and the political and economic profile of the Barents Region; Infrastructure and building in the Barents Region; People, cultures and livelihoods in the Barents Region; People and health at the Barents Region, Technological challenges and possibilities in the Barents Region.

Mode of delivery:

Implemented as face-to-face teaching.

Learning activities and teaching methods:

Lectures, discussions, visits, learning diaries, final portfolio.

Target group:

Especially, but not strictly restricted to the new students of the Master's Degree Programme (BCBU) in Environmental Engineering (BEE).

Prerequisites and co-requisites:

For BEE students, admission to the Master's programme, for which minimally a former bachelor's degree is required. For other students the Bachelor level studies in process or environmental engineering or respective knowledge.

Recommended optional programme components:

The other courses of the BEE curriculum

Recommended or required reading:

Lecture materials are provided during the course and in Optima.

Assessment methods and criteria:

Participation to the lectures and visits, writing learning diaries therein, and a final portfolio.
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:

BEE Study Advisor Marita Puikkonen (Department of Process and Environmental Engineering, University of Oulu)

Working life cooperation:

No

Other information:

-

488402A: Sustainable Development, 3 op

Voimassaolo: 01.01.2009 - 31.07.2015

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Leikkaavuudet:

488402S Sustainable Development 5.0 op

ECTS Credits:

3 cr

Language of instruction:

English

Timing:

Period 3

Learning outcomes:

The student is able to explain the multi-disciplinary nature of sustainability knows the principles and guidelines of sustainable development; and is able outline the future perspectives on the prosperity of environmental, social, economic and technological systems.

Contents:

Multidisciplinary, intensive and interactive course. Presentations on (e.g.) the principles of sustainable development; environmental justice; cultural diversity; globalization and business ethics; governance for sustainable development; resource use conflicts; water scarcity, sustainable consumption; technological change and sustainable development; international cooperation and action toward sustainable development.

Mode of delivery:

Implemented as student seminar and face-to-face teaching.

Learning activities and teaching methods:

Lectures, discussions, student presentations, opponency, group work, court case simulation.

Target group:

Master’s students of environmental engineering, especially of international master’s programmes such as the Master's Degree Programme (BCBU) in Environmental Engineering (BEE).

Prerequisites and co-requisites:

For BEE students, admission to the Master's programme, for which minimally a former bachelor's degree is required. For other students the Bachelor level studies in process or environmental engineering or respective knowledge.

Recommended optional programme components:

The other courses of the BEE curriculum

Recommended or required reading:

Lecture materials are provided during the course in Optima.

Assessment methods and criteria:

Quality of student presentations, activity in discussions, performance as an opponent and in the court case simulation.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course evaluation will be based on participation and activity during the course. The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

TkT Satu Ojala (Department of Process and Environmental Engineering, University of Oulu)

Working life cooperation:

No

Other information:

-

477307S: Research Methodology, 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Advanced Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Huuhtanen, Mika Ensio

Opintokohteen kielet: English

Leikkaavuudet:

480311S Research Methodology 3.5 op

ECTS Credits:

2 or 5 cr

Language of instruction:

English

Timing:

Implementation in autumn and spring semesters during periods 2-6

Learning outcomes:

After the course the student is able to define the role of research and different stages of research work. The student is also able to classify the stages and the subtasks of research work as well as important elements related to research, i.e. literature search, experimental work, and data processing. In addition, the student can evaluate the amount of work needed in research stages. The student can write scientific text and use references appropriately. The student also has the ability to recognise ethical issues related to research and analyse the meanings of those. He/she can use the principles of good scientific practises and is able to apply knowledge to research work.

Contents:

1) Science and research politics. 2) Research education. 3) Fundamentals of philosophy of science. 4) Starting research work: research types, funding, the process of research work, finding the research area, choosing the research topic, information sources. 5) Research plan and collecting data, experimental methods and significance of the variables, systematic experimental design, collecting experimental data, test equipment, reliability of the results, problems in laboratory experiments, modelling and simulation. 6) Mathematical analysis of results. 7) Reporting: writing a scientific text, referring, writing diploma, licentiate and doctoral theses, or reports. 8) Other issues connected to research work: ethical issues, integrity, and future. 9) Examples of scientific research in practice.

Mode of delivery:

Miniproject based on lectures in Optima during autumn term, contact lectures, laboratory training period during spring term.

Learning activities and teaching methods:

Contact lectures 6 h, miniproject 15 h, training period 70 h.

Target group:

Master’s degree students of the Department of Process and Environmental Engineering.

Prerequisites and co-requisites:

None

Recommended optional programme components:

-

Recommended or required reading:

Melville, S & Goddard, W: Research Methodology; An Introduction for Science and Engineering Students. Kenwyn 1996, Juta & Co. Ltd. 167 p. Hirsijärvi, S., Remes, P. & Sajavaara, P.: Tutki ja kirjoita. Jyväskylä 2004, GummerusKirjapaino Oy. 436 p. Material introduced in the lectures.

Additional literature :Paradis, J.G. & Zimmermann, M.L.: The MIT Guide to Science and Engineering Communication, 2nd ed. Cambridge 2002, The MITPress, 324 p. Nykänen, O.: Toimivaa tekstiä, Opas tekniikasta kirjoittaville. Helsinki 2002, TekniikanAkateemistenLiitto TEK.212 p.

Assessment methods and criteria:

Optima exercises (miniproject) and laboratory training.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

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

Person responsible:

University lecturer Mika Huuhtanen

Working life cooperation:

No

Other information:

The objective of the course is tofamiliarise the student with scientific research, scientific methods and data handling, especially in process and environmental engineering. The course will give the student the basis to do the research work and motivates him/her to begin post-graduate studies. The course gives the student team working skills and increases the co-operation between the students and the research and teaching staff. The students are exposed to experiences in co-operation between different fields of science, industry, and other universities and laboratories, as well as the skills for doctoral studies.
2 cr gained when only Optima period (in autumn semester) is finalized. Full 5 cr include both Optima and training periods.

477041S: Experimental Design, 5 op

Opiskelumuoto: Advanced Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Leiviskä, Kauko Johannes
Opintokohteen kielet: English

ECTS Credits:

5 cr

Language of instruction:

English

Timing:

Implementation in 4 th period.

Learning outcomes:

After this course the student knows the main software tools for experiment design and is able to use them. He can apply the main approaches for studying and evaluating the measurement reliability.

Contents:

Determining the uncertainty of measurements in chemical, physical and biochemical measurements, measurements reliability and traceability; Calculation examples supporting the learning of measurements uncertainty assessment preparation; Experimental design software (Modde, Minilab, Matlab tools); Experimental design preparation and execution in laboratory scale research. Test methods and variable significance, reliability of experimental data; Problems in laboratory, pilot and full scale experiments, problems in modelling and in simulation.

Mode of delivery:

Lectures and practical work.

Learning activities and teaching methods:

Contact lectures

Target group:

Master's students in DPEE

Prerequisites and co-requisites:

No prerequisites

Recommended optional programme components:

-

Recommended or required reading:

Material given in the lectures.

Assessment methods and criteria:

Assessment during the course, by continuous evaluation with lecture exams, and written report of the practical work.
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 Kauko Leiviskä

Working life cooperation:

No

Other information:

-

477203A: Process Design, 5 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Jani Kangas
Opintokohteen kielet: English
Leikkaavuudet:

480310A	Fundamentals of Process Design	5.0 op

ECTS Credits:

5 cr

Language of instruction:

English

Timing:

Periods 4-5.

Learning outcomes:

By completing the course the student is able to identify the activities of process design and the know-how needed at different design stages. The student can utilise process synthesis and analysis tools for creating a preliminary process concept and point out the techno-economical performance based on holistic criteria.

Contents:

Acting in process design projects, safety and environmentally conscious process design. Design tasks from conceptual design to plant design, especially the methodology for basic and plant design.

Mode of delivery:

Lectures and design group exercises.

Learning activities and teaching methods:

Lectures 30h, group work 50h and self-study 50h

Target group:

Bachelor students in DPEE

Prerequisites and co-requisites:

Objectives of 477202A Reactor analysis, 477304A Separation processes and 477012 Introduction to Automation Engineering

Recommended optional programme components:

-

Recommended or required reading:

Lecture handout, Seider, W.D., Seider, J.D. and Lewin, D.R. Product and process design principles: Synthesis, analysis and evaluation. John Wiley & Sons, 2004. (Parts) ISBN 0-471-21663-1

Assessment methods and criteria:

Combination of examination and design group exercises.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Scale 1-5

Person responsible:

University Teacher Jani Kangas

Working life cooperation:

-

Other information:

-

A432275: Advanced Module/Clean Production, 30 - 62 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Advanced Module
Laji: Study module
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Compulsory

488405S: Environmental Issues in the Barents Region, 5 op

Voimassaolo: 01.01.2009 -
Opiskelumuoto: Advanced Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: English

ECTS Credits:

3 cr

Language of instruction:

English

Timing:

Period 6

Learning outcomes:

After completing this course the students will be able to describe the environmental landscape of the Barents region, the impacts of past activities, and projections of future economic, social and technological development.

Contents:

Presentations on the environmental issues of North-Finland, North-Sweden, Northern Norway, The Republic of Karelia, Murmansk region and Arkhangelsk region. The regional presentations outline the impacts of technologies in the region, future technological developments, Northern resource exploitation projects, pollution prevention and remediation, impacts of multiple resource uses. Group works on sustainable living in the North, future technological and environmental scenarios, negotiation on conflicting resource uses, communication on technological development projects to the public and media.

Mode of delivery:

Implemented as face-to-face teaching.

Learning activities and teaching methods:

Lectures, field-trips, group works, course assignments, student presentations, role playing, negotiation simulation, pre-course ad post-course assignments.

Target group:

In University of Oulu: Especially the students of the Master's Degree Programme (BCBU) in Environmental Engineering (BEE); In addition: the students of BEE/BCBU partner universities.

Prerequisites and co-requisites:

For BEE students, admission to the Master's programme, for which minimally a former bachelor's degree is required. Please note that for participation to the course all students are required to have good English language skills! A pre-course assignment is to be completed prior to the course.

Recommended optional programme components:

The other courses of the Master's phase curriculum.

Recommended or required reading:

Lecture materials are provided during the course

Assessment methods and criteria:

Assessment is based on the performance of the different assignments, presentation of pre-course assignment, course activity, performance in group works and negotiation simulation and the submitted post-course assignment report.
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:

Eva Pongrácz (Thule Institute, University of Oulu)

Working life cooperation:

No

Other information:

Resources allowing, the course is organized intensively during one week in location outside of Oulu, at the Oulanka Research Station, Kuusamo Finland as part of the BCBU cooperation. Alternatively, the course is organized e.g. at the University of Oulu, Finland. Good communication skills in English are necessary requirement of participation in the course!

488203S: Industrial Ecology, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Leikkaavuudet:

ay488203S	Industrial Ecology and Recycling	5.0 op
480370S	Industrial Ecology and Recycling	5.0 op

ECTS Credits:

5 cr

Language of instruction:

English

Timing:

Implementation in autumn semester during 2 th period.

Learning outcomes:

The student will be able to use the tools of industrial ecology and apply them to industrial activity. The student can also analyze the interaction of industrial, natural and socio-economic systems and able to judiciously suggest changes to industrial practice in order to prevent negative impacts. The student can also analyze the examples of industrial symbioses and eco-industrial parks and able to specify the criteria of success for building eco-industrial parks.

Contents:

Material and energy flows in economic systems and their environmental impacts. Physical, biological and societal framework of industrial ecology. Industrial metabolism, corporate industrial ecology, eco-efficiency, dematerialization. Tools of industrial ecology, such as life-cycle assessment, design for the environment, green chemistry and engineering. Systems-level industrial ecology, industrial symbioses, eco-industrial parks.

Mode of delivery:

Lectures.

Learning activities and teaching methods:

Lectures 30 h, compulsory exercise work.

Target group:

Master's degree students of the Department of Process and Environmental Engineering

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Lecture notes; Graedel T.E & Allenby B.R.: Industrial Ecology. New Jersey: Prentice Hall, 2003.

Assessment methods and criteria:

Assignments and written final exam
Read more about assessment criteria at the University of Oulu webpage.

Grading:

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

Person responsible:

University researcher Satu Ojala

Working life cooperation:

No

Other information:

-

488202S: Production and Use of Energy, 5 op

Opiskelumuoto: Advanced Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Huuhtanen, Mika Ensio
Opintokohteen kielet: English
Leikkaavuudet:

488208A	Basics of production and use of energy	5.0 op
470057S	The Energy Economy of Industrial Establishments	3.5 op

ECTS Credits:

5 cr

Language of instruction:

English

Timing:

Implementation in autumn semester during 1 st period.

Learning outcomes:

The student is able to define different methods and techniques to generate electricity and heat. He/she is able to explain steam power plant operating principles and is able to compare operation of different kinds of steam power plants. The student can describe the environmental impacts of energy production and is able to compare the environmental impacts of different ways of producing energy. The student is able to identify functioning of the fossil based and renewable energy production systems. He/she is able to explain how the electricity markets work. The student is also able to explain the adequacy of energy reserves.

Contents:

Structure of energy production and consumption. Systems for electric transportation, storing and distribution. Distribution and adequacy of energy resources. Effects of environment contracts on the use of energy resources. Environmental comparison of different energy production methods and fuels. Energy markets. Development views of energy technology.

Mode of delivery:

Lectures

Learning activities and teaching methods:

Lectures 40h.

Target group:

Master's degree students of the Department of Process and Environmental Engineering

Prerequisites and co-requisites:

The courses 477011P and 488011P Introduction to Process and Environmental Engineering I and II are recommended.

Recommended optional programme components:

-

Recommended or required reading:

Materials delivered via the Optima environment.

Assessment methods and criteria:

Written final exam
Read more about assessment criteria at the University of Oulu webpage.

Grading:

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

Person responsible:

University lecturer Mika Huuhtanen.

Working life cooperation:

No

Other information:

-

477309S: Process and Environmental Catalysis, 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Advanced Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Leikkaavuudet:

470226S	Catalytic Processes	5.0 op

ECTS Credits:

5 cr

Language of instruction:

English

Timing:

Implementation in autumn semester, during 2 nd period.

Learning outcomes:

After the course the student is able to define the fundamentals and history of catalysis and he/she can explain the economical and environmental meaning of catalysis. The student is capable of specifying the design, selection and testing of catalysts and catalytic reactors and processes. He/she is able to explain the most important industrial catalytic processes, the use of catalysts in environmental technology, catalyst research and the significance of an interdisciplinary approach in the preparation, development and use of catalysts. He/she recognises the connection between catalysis and green chemistry and the role of catalysis in sustainable processes and energy production.

Contents:

Definition of catalysis and a catalyst, history of catalysis, economical, social and environmental meaning. Preparation of catalysts, principles, selection, design and testing of catalysts and catalytic reactors. Kinetics and mechanisms of catalytic reactions, catalyst deactivation. Industrially important catalysts, catalytic reactors and catalytic processes. Environmental catalysis. Catalysts in air pollution control and purification of waters and soil.Catalysis and green chemistry. Catalysis for sustainability.Principles in the design of catalytic processes.

Mode of delivery:

Lectures including design exercises.

Learning activities and teaching methods:

Lectures 30 h, exercises 10 h and homework 30 h.

Target group:

Master's degree students of the Department of Process and Environmental Engineering.

Prerequisites and co-requisites:

The courses 477011P Introduction to Process and Environmental Engineering I, 488011P Introduction to Environmental Engineering, 780109P Basic Principles in Chemistry and 477306S Non-ideal reactor are recommended beforehand.

Recommended optional programme components:

-

Recommended or required reading:

Lecture handout; Richardson, J.T.: Principles of Catalyst Development. New York. 1989, 288 pp.; Janssen, F.J.J.G. & van Santen, R.A.: Environmental Catalysis. NIOK, Catalytic Science Series, Vol. 1. 1999. 369 pp. *Additional literature:* Ertl, G., Knözinger, J. & Weitkamp, J.: Handbook of Heterogeneous Catalysis. Vol. 1-5. Weinheim. 1997, 657 p.; Thomas, J.M. & Thomas, W.J.: Principles and Practice of Heterogenous Catalysis. Weinheim 1997. 657 pp.; Somorjai, G.A.: Surface Chemistry and Catalysis. New York 1994, 667 pp.; van Santen, R.A., van Leuwen, P.W.N.M., Mouljin, J.A. & Averill, B.A.: Catalysis: An Integrated Approach, 2nd ed. Studies in Surface Science and Catalysis 123. Amsterdam 1999, Elsevier Sci. B.V. 582 pp.

Assessment methods and criteria:

Written examination and homework.
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 research fellow Tanja Kolli

Working life cooperation:

No

Other information:

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488205S: Environmental Load of Process Industry, 4 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Advanced Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Niina Koivikko

Opintokohteen kielet: English

Leikkaavuudet:

ay488215S	Industry and Environment (OPEN UNI)	5.0 op
488215S	Industry and Environment	5.0 op
488221S	Environmental Load of Industry	5.0 op
480314S	Control of Environmental Load from Processes of Pulp and Paper Industry	2.5 op
480315S	Control of Environmental Load from Processes of Metallurgical Industry	2.5 op

ECTS Credits:

4 cr

Language of instruction:

English

Timing:

Implementation in spring semester during 6 th period.

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 able to apply the main emission control systems and techniques in different industrial sectors. He/she has the skills to apply BAT-techniques in emission control. 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:

Lectures.

Learning activities and teaching methods:

Lectures 30 h.

Target group:

Master’s degree students of the Department of Process and Environmental Engineering

Prerequisites and co-requisites:

The courses 477011P Introduction to Process Engineering, 488011P Introduction to Environmental Engineering, 488204S Air Pollution Control Engineering and 488110S Water and Wastewater Treatment recommended before-hand.

Recommended optional programme components:

-

Recommended or required reading:

Material represented in lectures and in the Optima environment.

Assessment methods and criteria:

Written final exam
Read more about assessment criteria at the University of Oulu webpage.

Grading:

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

Person responsible:

University researcher Satu Ojala

Working life cooperation:

No

Other information:

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488204S: Air Pollution Control Engineering, 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Advanced Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Leikkaavuudet:

ay488204S	Air Pollution Control Engineering (OPEN UNI)	5.0 op
488213A	Sources and control of air pollution	5.0 op
480380S	Air Protection Techniques	5.0 op

ECTS Credits:

5 cr

Language of instruction:

English

Timing:

Implementation in autumn semester during 3 rd period.

Learning outcomes:

The student is able to explain what kind of air emissions originate from certain industries and power plants, and can explain their environmental impacts. The student is able to explain the common air pollution control systems for different emissions (SO2, NOx, VOC, CO2, dust) and is able to design air pollution cleaning devices. He/she can describe how air emissions are measured. In addition, the student is able to describe the main laws related to air emission control.

Contents:

Effects of pollution on the atmosphere. Acid rain. Climate change. Ozone. Effects of pollution on health, nature and buildings. Legislation. Measurement of emissions. Long - range transport and diffusion models. Emission control technologies, VOC emissions, SOx emissions, NOX emissions, heavy metals, POPs, HAPs, etc.

Mode of delivery:

Lectures.

Learning activities and teaching methods:

Lectures 30h and exercises 10h.

Target group:

Master’s degree students of the Department of Process and Environmental Engineering

Prerequisites and co-requisites:

The courses 477011P Introduction to Process Engineering, 488011P Introduction to Environmental Engineering and 780109P Basic Principles in Chemistry recommended beforehand.

Recommended optional programme components:

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Recommended or required reading:

Materials in the Optima environment. de Nevers; N.: Air Pollution Control Engineering. 2nd ed. McCraw-Hill 2000. 586 pp

Additional literature: Singh, H. B.: Composition, Chemistry, and Climate of the Atmosphere. New York 1995. 527 pp.; Bretschneider, B. & Kurfurst, J.: Air Pollution Control Technology. Elsevier, Amsterdam 1987. 296 pp.; Hester, R. E. & Harrison, R. M.: Volatile Organic Compound in the Atmosphere. Issues in Environmental Science and Technology. Vol. 4. Bath 1995; Hester, R. E. & Harrison, R. M.: Waste Incineration and the Environment. Issues in Environmental Science and Technology. Vol 4. Bath 1995.

Assessment methods and criteria:

Written final exam
Read more about assessment criteria at the University of Oulu webpage.

Grading:

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

Person responsible:

University researcher Satu Ojala

Working life cooperation:

No

Other information:

-

488104A: Industrial and municipal waste management, 5 op

Voimassaolo: 01.08.2005 - 31.07.2017
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Elisangela Heiderscheidt
Opintokohteen kielet: English
Leikkaavuudet:

480160S	Waste Management of Communities and Industry	5.0 op

ECTS Credits:

5 cr

Language of instruction:

English

Timing:

The course unit is held in the spring semester, during periods 5-6

Learning outcomes:

The student will acquire a wilder view of what is waste and how it is generated and managed in communities and industries. Student will be familiar with waste management hierarchy and how waste legislation regulates waste management. She/he will get basic knowledge about waste treatment methods including their sustainability and related environmental impacts. As well as, how a series of factors influence the planning of waste management activities in industries and municipalities. The student will also be able to understand the energy and material recovery potential within the waste sector.

Contents:

Waste management hierarch, waste prevention principle, municipal waste management, waste management in industries, waste legislation, municipal and industrial waste treatment methods, international treaties related to waste management (Basel convention and Clean Development Mechanism projects: carbon trading), waste to energy principle.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Learning methods: A) Active learning method: Lectures (24 h), group work (45 h), self-study for examination (55,5 h) and field visits (8 h) or alternatively B) Group work (45 h), self-study for examination (87,5 h).

Target group:

Students in bachelor program of environmental engineering

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Lecture hand-outs, notes and other materials delivered in lectures. Waste management: a reference handbook illustrated edition, 2008 (electronic book, ISBN 9781598841510).

Assessment methods and criteria:

The students' performance during the course is assessed by successful completion of stages A and B as follow: A) Completion of the course work which consists of group exercises 1 and 2 each carrying 30% weight in the course final grade; B) Course examination carrying 40% weight in the course final grade (Note that a passing grade (1-5) for the course examination is required for the completion of the course). 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:

Reseacher Elisangela Heiderschedt

Working life cooperation:

No

Other information:

-

Optional; choose 30 ECTS

488201A: Environmental Ecology, 5 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: English
Leikkaavuudet:

488210A	Environmental science and technology	5.0 op
ay488201A	Environmental Ecology (OPEN UNI)	5.0 op
488406A	Introduction to Environmental Science	5.0 op
480001A	Environmental Ecology	5.0 op

ECTS Credits:

5 cr

Language of instruction:

English

Timing:

Implementation in spring semester during 4 th and 5 th period.

Learning outcomes:

The student is able to define the basic concepts of environmental ecology. He/she has knowledge about the state of the environment and is able to explain the essential environmental problems and the main effects of pollution. In addition, the student knows some solutions to environmental problems and is aware of ethical thinking in environmental engineering. The student also has basic knowledge about toxicology and epidemiology.

Contents:

Principles of environmental ecology. Roots of environmental problems. Global air pollution: ozone depletion, acid deposition, global warming and climate change. Water pollution, eutrophication, overexploitation of ground and surface water. Main effects of pollution and other stresses. Non-renewable and renewable energy. Energy conservation and efficiency. Hazardous and solid waste problem. Principles of toxicology, epidemiology, and risk assessment. Environmental ethics.

Mode of delivery:

web-based learning.

Learning activities and teaching methods:

E-learning in the Optima learning environment.

Target group:

Bachelor's degree students of environmental engineering.

Prerequisites and co-requisites:

The courses 477011P Introduction to Process and Environmental Engineering I and 488011P Introduction to Environmental Engineering recommended beforehand.

Recommended optional programme components:

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Recommended or required reading:

Chiras D.: Environmental Science: Creating a Sustainable Future. New York, Jones and Bartlett Publishers, 2001.

Assessment methods and criteria:

Exercises and exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

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

Person responsible:

University researcher Satu Ojala

Working life cooperation:

No

Other information:

-

477310S: Advanced Catalytic Processes, 5 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Advanced Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Satu Ojala, Keiski, Riitta Liisa
Opintokohteen kielet: English
Leikkaavuudet:

480360S	Catalysts in Environmental Technology	5.0 op

ECTS Credits:

5 cr

Language of instruction:

English

Timing:

Implementation in spring semester during 5 th period every even year.

Learning outcomes:

After completing the course the student can explain the interdisciplinary connection of catalysis with material and surface science, define new catalyst preparation methods and application areas, catalytic reaction and process engineering, and methods in catalyst research (experimental and computational methods). He/she is also able to design and do research work by emphasising research methods and innovations in catalysis. He/she is able to explain the latest knowledge connected to catalyst research and applications. He/she is also capable of explaining the relation and differences between heterogeneous, homogeneous and biocatalysis.

Contents:

The course contents is divided into the following themes 1) surface chemistry and catalysis, 2) new catalyst preparation methods, 3) catalysis for a sustainable production and energy, and green chemistry and engineering and catalysis, 4) design of catalysts and catalytic processes (reactor and process intensification, process improvements, new catalysts and catalytic processes, new opportunities by catalysis), 5) phenomena integration and catalysis and 6) new innovations in catalyst research.

Mode of delivery:

Lectures and a seminar work

Learning activities and teaching methods:

Lectures 30 h, seminar work 25 h.

Target group:

Master's degree students of the Department of Process and Environmental Engineering.

Prerequisites and co-requisites:

The courses 477309S Process and Environmental Catalysis and 488204A Air Pollution Control Engineering.

Recommended optional programme components:

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Recommended or required reading:

Thomas, J.M. & Thomas, W.J.: Principles and Practice of Heterogeneous Catalysis. Weinheim 1997. 657 p.; Somorjai, G.A.: Surface Chemistry and Catalysis. New York 1994. 667 p.; Van Santen, R.A., van Leuwen, P.W.N.M., Moulijn, J.A. & Averill, B.A.: Catalysis: An Integrated Approach, 2nd. edition. Research Articles.
Further literature: Ertl, G., Knözinger, H. &Weitkamp, J.: Handbook of Heterogeneous Catalysis. Vol. 1-5. Weinheim 1997; Morbidelli, M., Gavriilidis, A. &Varma, A.: Catalyst Design, Optimal Distribution of Catalyst in Pellets, Reactors, and membranes. New York 2001, Cambridge University Press. 227 p.; Anastas, P.T. & Crabtree, R.H. (eds.): Green catalysis, volume 2: Heterogeneous Catalysis. Weinheim 2009, 338 p.

Assessment methods and criteria:

Written examination and a seminar work including reporting and presentation.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

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

Person responsible:

University researcher Satu Ojala

Working life cooperation:

No

Other information:

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477503S: Simulation, 3 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Advanced Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Esko Juuso
Opintokohteen kielet: English

Leikkaavuudet:

477523S	Simulation	5.0 op
470448A	Simulation	3.0 op

ECTS Credits:

3 cr

Language of instruction:

Finnish and English

Timing:

Implementation in 3 rd period. Recommended for fourth year students (M.Sc.).

Learning outcomes:

After the course the student is capable of explaining the concepts and operation principles of process simulators. The student has skills to construct simulation models in Matlab-Simulink environment and to explain the operation of these models. The student recognizes the key problems of the simulation and is able to choose suitable modeling solutions in process modeling and control. Moreover, the student is able to use key concepts of event based, interactive and distributed simulation. After the course the student is able to search other relevant simulation languages and programming tools.

Contents:

Modelling, modular and equation based simulation, dynamic simulation, intelligent methods in simulation, simulation in automation, event handling in continuous simulation, simulation of production processes, distributed simulation, integration with other systems, simulation languages and programming tools

Mode of delivery:

Tuition is implemented mainly as face-to-face teaching.

Learning activities and teaching methods:

The amount of guided teaching is 26 hrs, including lectures, demonstrations, exercises and seminars. Totally 54 hrs are allocated for self-study, which consists of three parts: (1) a case study covering several topics applied in a chosen problem, (2) a seminar work concentrating on a single topic, and (3) the final report.

Target group:

M.Sc. students in process and environmental engineering, machine engineering, computer engineering and industrial engineering and management.

Prerequisites and co-requisites:

No prerequisites.

Recommended optional programme components:

Programming in Matlab course reinforces abilities for the exercises and the case study.

Recommended or required reading:

Lecture notes and exercise materials. Material is in Finnish and in English

Assessment methods and criteria:

The assessment of the course is based on the exercises, case study, seminar and the final report. Final exam is an alternative for the final report.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

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

Person responsible:

University teacher Esko Juuso

Working life cooperation:

No

Other information:

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477209S: Chemical Process Simulation, 5 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Advanced Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Jani Kangas

Opintokohteen kielet: English

ECTS Credits:

5 cr

Language of instruction:

English

Timing:

Periods 2-3.

Learning outcomes:

The student has the ability to convert a process flow diagram into a form compatible with process simulation software. She/he has skills to evaluate realistic process conditions in a typical chemical process. The student can apply proper thermodynamic property models for simulation purposes. She/he can name the advantages and disadvantages of using the sequential modular solving approach in chemical process modelling and simulation. She/he is capable of solving a computer simulation case for a typical chemical process. The student is able to analyze the simulation results with respect to realistic values.

Contents:

The architecture of a process simulator. Thermodynamic property models and databanks. Degrees of freedom analysis. Steady-state simulation. Sequential modular, and equation-oriented approach in simulation. Numerical solving methods. Heuristics for chemical process simulation.

Mode of delivery:

Lectures, introductory examples and group exercises with process simulation software.

Learning activities and teaching methods:

Lectures 16h and self-study 114h

Target group:

Master’s students in Process Design and Chemical Engineering orientations

Prerequisites and co-requisites:

Prerequisite: 477204S Chemical Engineering Thermodynamics or equivalent knowledge.

Recommended optional programme components:

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Recommended or required reading:

Material distributed on lectures. Additional literature, Turton, R., Bailie, R.C., Whiting, W.B. & Shaeiwitz, J. A.: Analysis, synthesis, and design of chemical processes. 3 rd Ed. Prentice Hall. (Parts) ISBN 0-13-512966-4.

Assessment methods and criteria:

Group exercise reports and an individual exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Scale 1-5

Person responsible:

University Teacher Jani Kangas

Working life cooperation:

-

Other information:

-

477306S: Non-ideal Reactors, 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Advanced Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Keiski, Riitta Liisa

Opintokohteen kielet: English

Leikkaavuudet:

470222A Reactor Analysis and Design II 5.0 op

ECTS Credits:

5 cr

Language of instruction:

English

Timing:

Implementation in autumn semester during 3 rd period.

Learning outcomes:

Objective: By means of the residence time distribution theory, students adopt a way of thinking in modeling which is based on the concept of probability.
Learning outcomes: After completing the course the student can analyse the effect of non-ideal mixing conditions on the behaviour of a reactor. He/she is capable of explaining the mechanisms of heterogeneous reactions, especially with methods that are used to analyse the effect of mass and heat transfer on the observed kinetics of heterogeneous reactions. The student has rudimentary skills to conduct demanding reactor analysis and to design heterogeneous reactors.

Contents:

Mixing models of a flowing material. Residence time distribution theory. Heterogeneous catalysis and biochemical reactions: mechanisms, mass and heat transfer, and reactor design. Gas-liquid reactions: mechanisms, mass transfer, and reactor design. Design heuristics. Microreactors.

Mode of delivery:

Lectures including exercises.

Learning activities and teaching methods:

Lectures 35 h, exercises 12 h, homework 12 h

Target group:

Master's degree students of the Department of Process and Environmental Engineering.

Prerequisites and co-requisites:

Courses 477201A Energy and Material Balances and 477202A Reactor Analysis are recommended beforehand.

Recommended optional programme components:

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Recommended or required reading:

Nauman, E.B.: Chemical Reactor Design. New York, John Wiley & Sons.1987; Winterbottom, J.M. & King, M.B. (Editors) Reactor Design for Chemical Engineers.Padstow 1999, T.J. International Ltd. 442 s. *Additional literature:*Gianetto, A. &Silveston, P.L.: Multiphase Chemical Reactors: Theory, Design, Scale-up. Hemisphere, Washington, D. 1986; Froment, G. & Bischoff, K.B.: Chemical Reactor Analysis and Design. New York, John Wiley & Sons. 1990; Hessel, V., Hardt, S. &Löwe, H.: Chemical Micro Process Engineering. Weinheim 2004, Wiley-VHC Verlag GmbH & Co. 674 p, Salmi, T., Mikkola, J.-P.&Wärnå, J. Chemical reaction engineering and reactor technology.Boca Raton 2011, CRC Press, 615 p.

Assessment methods and criteria:

Examination. Homework assignments affect the course grade.
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 Riitta Keiski

Working life cooperation:

No

Other information:

By means of the residence time distribution theory, students adopt a way of thinking in modeling which is based on the concept of probability.

477206S: Advanced Process Design, 6 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Advanced Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Ahola, Juha Lennart

Opintokohteen kielet: English

Leikkaavuudet:

477223S	Advanced Process Design	5.0 op
480350S	Advanced Process Design	5.0 op

ECTS Credits:

6 cr

Language of instruction:

English

Timing:

Periods 5-6.

Learning outcomes:

The student is able to produce a preliminary chemical process concept. She/he can apply systematic process synthesis tools, chemical process simulation tools and whole process performance criteria in the conceptual process design phase. Furthermore, the student is able to produce process design documents. The student will acquire skills how to work as a member in an industrial chemical process design project. She/he will experience by team work the hierarchical character of the conceptual process design, the benefits of the systematic working methods and the need to understand the whole process performance when optimal design is sought. The student understands the importance of innovation and creative work.

Contents:

Conceptual process design and hierarchical decision making. Heuristics of process design. Design methodology: synthesis, analysis and evaluation. Design cycle. Performance evaluation of the chemical processes. Team work and meetings.

Mode of delivery:

Design projects in small groups.

Learning activities and teaching methods:

Project meetings 15h and project group work 145h

Target group:

Master’s students in DPEE

Prerequisites and co-requisites:

Objectives of 477203A Process Design

Recommended optional programme components:

Part of Process Design Module

Recommended or required reading:

Lecture handout, Seider, W.D., Seider, J.D. and Lewin, D.R. Product and process design principles: Synthesis, analysis and evaluation. John Wiley & Sons, 2004. (Parts) ISBN 0-471-21663-1

Assessment methods and criteria:

Project work with oral and written reporting.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Scale 1-5

Person responsible:

University Lecturer Juha Ahola

Working life cooperation:

-

Other information:

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477305S: Flow Dynamics, 5 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Advanced Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Muurinen, Esa Ilmari
Opintokohteen kielet: Finnish
Leikkaavuudet:

470303S	Flow Dynamics	3.5 op

ECTS Credits:

5 cr

Language of instruction:

Finnish, can be completed in English as a book examination.

Timing:

Implementation in autumn semester during 2 nd period.

Learning outcomes:

After completing the course the student is able to formulate the partial differential equations describing flow of fluids and to solve these equations in systems with simple geometry using difference, finite element and finite volume methods. The student is also able to formulate and solve the equations describing flow of granular material based on molecular dynamics. He/she is able to choose the experimental methods for validation of the calculated results and the methods to measure the most common properties describing fluid flow. After the course the student is able to model simple flow configurations using CFD and to design experimental systems and measurements for verifying computational results.

Contents:

Equations in fluid dynamics. Partial differential equations. Difference method. Graphical representation. Modelling the turbulence. Finite element method. Finite volume method. Molecular dynamics. Experimental fluid dynamics.

Mode of delivery:

Lectures and compulsory exercise done in small groups.

Learning activities and teaching methods:

Lectures 25 h, and exercise 15 h. For foreign students written examination based on given literature and a simulation exercise.

Target group:

Master’s degree students of process and environmental engineering.

Prerequisites and co-requisites:

Courses 477301A Momentum Transfer, 031019P Matrix Algebra and 031022P Numerical Methods 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:

Anderson J.D.: Computational Fluid Dynamics, McGraw-Hill, 1995, 608 p. Hämäläinen J. & Järvinen J.: Elementtimenetelmävirtauslaskennassa, CSC – Tieteellinenlaskenta Oy, 1994, 212 p. Versteeg, H.K. &Malalasekera, W.: An Introduction to Computational Fluid Dynamics, Longman Scientific and Technical, 1995, 257 p. Pöschel, T. & Schwager, T.: Computational Granular Dynamics, 2005, 322 p. Tavoularis, S.: Measurements in Fluid Mechanics, 2005, 354 p.
Additional literature: Shaw, C.T.: Using Computational Fluid Dynamics, Prentice Hall, 1992, 251 p.; Nakayama, Y. & Boucher, R.F.: Introduction to Fluid Mechanics, Arnold, 1999, 308 p.: Haataja J., Käpyaho, J. &Rahola, J.: Numeerisetmenetelmät. CSC – Tieteellinenlaskenta Oy, 1993, 236 p; Rathakrishnan, E.:Instrumentation, Measurements, and Experiments in Fluids, 2007, 492 p.

Assessment methods and criteria:

Examination or a learning diary and exercise.
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:

Laboratory manager Esa Muurinen

Working life cooperation:

No

Other information:

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477311S: Advanced Separation Processes, 5 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Advanced Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Keiski, Riitta Liisa
Opintokohteen kielet: English

ECTS Credits:

5 cr

Language of instruction:

English

Timing:

Implementation in spring semester during 6 th period every even year.

Learning outcomes:

After completing the course the student is able to review the most recent methods and techniques for separation and purification of components and products, e.g. in the chemical, food, and biotechnology industries. He/she is able to define the principles of green separation processes and their research status and potentiality in industrial applications.

Contents:

The course is divided into lectures given by visiting experts from different fields (industry, research institutes and universities) and seminars given by students and senior researchers. The lectures open up the newest innovations in separation and purification technologies. The lectures can include for example the following themes: Phenomena in Supercritical fluid extraction, Pressure-activated membrane processes, Reverse osmosis, Nanofiltration, Ultrafiltration, Microfiltration, Pervaporation, Polymer membranes, Dialysis, Electrolysis and Ion-exchange, Forces for adsorption and Equilibrium adsorption isotherms, Sorbent materials and heterogeneity of surfaces, Predicting mixture adsorption, Rate processes

in adsorption/adsorbers and adsorber dynamics, Cyclic adsorption processes, Temperature and pressure swing adsorption. Innovative separation methods, Phenomena integration, New hybrid materials as separation agents. Fluids and their application in gas extraction processes, Solubility of compounds in supercritical fluids and phase equilibrium.Extraction from solid substrates: Fundamentals, hydrodynamics and mass transfer, applications and processes (including supercritical water and carbon dioxide). Counter-current multistage extraction: Fundamentals and methods, hydrodynamics and mass transfer, applications and processes. Solvent cycles, heat and mass transfer, methods for precipitation.Supercritical fluid chromatography.Membrane separation of gases at high pressures.The topics of the course seminars will change annually depending on the research relevance.The course is divided into lectures given by visiting experts from different fields (industry, research institutes and universities) and seminars given by students and senior researchers. The lectures open up the newest innovations in separation and purification technologies. The lectures can include for example the following themes: Phenomena in Supercritical fluid extraction, Pressure-activated membrane processes, Reverse osmosis, Nanofiltration, Ultrafiltration, Microfiltration, Pervaporation, Polymer membranes, Dialysis, Electrolysis and Ion-exchange, Forces for adsorption and Equilibrium adsorption isotherms, Sorbent materials and heterogeneity of surfaces, Predicting mixture adsorption, Rate processes in adsorption/adsorbers and adsorber dynamics, Cyclic adsorption processes, Temperature and pressure swing adsorption. Innovative separation methods, Phenomena integration, New hybrid materials as separation agents. Fluids and their application in gas extraction processes, Solubility of compounds in supercritical fluids and phase equilibrium.Extraction from solid substrates: Fundamentals, hydrodynamics and mass transfer, applications and processes (including supercritical water and carbon dioxide). Counter-current multistage extraction: Fundamentals and methods, hydrodynamics and mass transfer, applications and processes. Solvent cycles, heat and mass transfer, methods for precipitation.Supercritical fluid chromatography.Membrane separation of gases at high pressures.The topics of the course seminars will change annually depending on the research relevance.

Mode of delivery:

With the lectures the students will familiarize themselves to the latest research publications.

Learning activities and teaching methods:

Lectures 30 h, seminar work 25 h.

Target group:

Master’s degree students of the Department of Process and Environmental Engineering.

Prerequisites and co-requisites:

The courses 477304A Separation Processes and 477308S Multicomponent Mass Transfer are recommended beforehand.

Recommended optional programme components:

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Recommended or required reading:

The course literature will be chosen when the course is planned. Latest scientific research articles. Further literature: Green Separation Processes, Edited by: Afonso, A.M. & Crespo, J.G. 2005 Wiley-VCH, Separation Processes in the Food and Biotechnology Industries, Edited by: Grandison, A.S. & Lewis, M.J. 1996 Woodhead Publishing.

Assessment methods and criteria:

Portfolio or written examination and a seminar work including reporting and presentation.
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 Riitta Keiski

Working life cooperation:

No

Other information:

-

488206S: Sustainable Energy Project, 5 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Huuhtanen, Mika Ensio

Opintokohteen kielet: English

ECTS Credits:

5 cr

Language of instruction:

English

Timing:

4 th and 5 th periods

Learning outcomes:

Objective: The student is able to adapt the (skills) tools learned in previous courses to complete an energy production and management design project. The student will solve an engineering problem related to sustainable energy generation in cold climate.
Learning outcomes: The student is able to describe the key practical issues related to sustainable energy generation. The student will evaluate the relevant instruments, tools and measures required for sustainable energy production, distribution, and end-use efficiency. The student will demonstrate the ability to select the proper tools, and methods to solve the design problem. The student will also acquire skills to work as a member in an engineering design project as part of a team. He/she will gain the experience to carry out a real project and produce a documentation of the engineering solution.

Contents:

A design project to adapt small-scale renewable energy production and management, greenhouse gas reduction and/or utilization, wind, solar, and geothermal energy generation. Management of energy efficiency. Energy engineering and design principles. Performance evaluation and sustainability assessment of the selected project. Team work, group meetings and problem solving.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures, design projects in small groups, presentations and reporting.

Target group:

Master’s degree students of the Department of Process

Prerequisites and co-requisites:

The course 488202 Production and use of energy is a compulsory, and 488203S Industrial Ecology and 477309S Process and environmental catalysis courses are recommended prerequisites to the project.

Recommended optional programme components:

-

Recommended or required reading:

Materials delivered on lectures and during the group meetings. *Additional literature:* Manuals and databases, depends on the project work selected.

Assessment methods and criteria:

Written report with the documentation of the engineering solution
Read more about assessment criteria at the University of Oulu webpage.

Grading:

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

Person responsible:

University lecturer Mika Huuhtanen

Working life cooperation:

No

Other information:

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A432226: Module of Option/Basic Module of Water and Environment, 30 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Module of the Option
Laji: Study module
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Compulsory

030008P: Information Skills for foreign degree students, 1 op

Voimassaolo: 01.08.2012 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Faculty of Technology
Arvostelu: 1 - 5, pass, fail
Opettajat: Koivuniemi, Mirja-Liisa, Sassali, Jani Henrik
Opintokohteen kielet: English

ECTS Credits:

1 ECTS credit

Language of instruction:

English

Timing:

The course is held in the spring semester

Learning outcomes:

Students know the different phases of scientific information retrieval process and basic techniques of systematic information search. They will find the most important reference databases of their discipline and know how to evaluate information sources and search results.

Contents:

Retrieval of scientific information, the search process, key databases of the discipline, and evaluation of information retrieval and information sources.

Mode of delivery:

Blended teaching: classroom training, web-based learning material and exercises in Optima environment, a final assignment on a topic of the student’s own choice

Learning activities and teaching methods:

Training sessions 8h, self-study 19h

Target group:

The course is intended to degree students of the Faculty of Science and the Faculty of Technology. The course is compulsory for the Master´s Degree Programme (BCBU) in Environmental Engineering (BEE).

Prerequisites and co-requisites:

It is recommended that the student knows the basic services of Oulu University Library. The student can participate in the Library ABC –training (http://www.oulu.fi/library/node/10710).

Recommended optional programme components:

-

Recommended or required reading:

Parts from the following chapters of the Toolbox of Research: https://wiki.oulu.fi/display/tor/1.1+Finding+scientific+information
https://wiki.oulu.fi/display/tor/1.3.1+Evaluation+based+on+academic+publishing

Assessment methods and criteria:

Passing the course requires participation in the training sessions and successful completion of the course assignments.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

pass/fail

Person responsible:

Science and Technology Library Tellus, tellustieto (at) oulu.fi

Working life cooperation:

-

Other information:

-

900017Y: Survival Finnish Course, 2 op

Voimassaolo: 01.08.1995 -
Opiskelumuoto: Language and Communication Studies
Laji: Course
Vastuuyksikkö: Language Centre
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

ay900017Y	Survival Finnish Course (OPEN UNI)	2.0 op

Proficiency level:

A1.1

Status:

-

Required proficiency level:

No previous Finnish studies.

ECTS Credits:

2 ECTS credits

Language of instruction:

Finnish and English

Timing:

-

Learning outcomes:

By the end of the course the student can understand and use some very common everyday expressions and phrases, and s/he can locate informational content in simple texts and messages. The student also knows the basic characteristics of Finnish language and Finnish communication styles.

Contents:

This is an introductory course which aims to help students to cope with the most common everyday situations in Finnish. During the course, students learn some useful everyday phrases, some general features of the vocabulary and grammar, and the main principles of pronunciation.

The topics and communicative situations covered in the course are: general information about the Finnish language, some politeness phrases (how to greet people, thank and apologize), introducing oneself, giving and asking for basic personal information, numbers, some time expressions (how to tell and ask the time, days of the week, time of day), food, drink and asking about prices.

The structures studied are: personal pronouns and their possessive forms, forming affirmative, negative and interrogative sentences, the conjugation of some verbs, the basics of the partitive singular and some local cases for answering the ‘where'-question.

Mode of delivery:

Contact teaching

Learning activities and teaching methods:

Lessons twice a week (24 h) and self study (26 h).

Target group:

International degree and post-graduate degree students of the University.

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Will be provided during the course.

Assessment methods and criteria:

Regular and active participation in the weekly lessons (twice a week), homework assignments and written exam at the end of the course will be observed in assessment.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Grading scale is 1-5.

Person responsible:

Anne Koskela

Working life cooperation:

-

Other information:

Sign-up in WebOodi. The lessons will be held twice a week during a 6-week period.

900013Y: Beginners' Finnish Course 1, 3 op

Voimassaolo: 01.08.1995 -
Opiskelumuoto: Language and Communication Studies
Laji: Course
Vastuuyksikkö: Language Centre
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

ay900013Y	Beginners' Finnish Course 1 (OPEN UNI)	2.0 op

Proficiency level:

A1.2

Status:

-

Required proficiency level:

A1.1, Completion of the Survival Finnish course (900017Y) or the equivalent language skills.

ECTS Credits:

2 ECTS credits

Language of instruction:

As much Finnish as possible; English will be used as a help language.

Timing:

-

Learning outcomes:

By the end of the course the student can understand and use some familiar and common everyday expressions relating to her/himself and everyday situations. S/he can interact in a simple way provided the other person talks slowly and clearly and is willing to help. The student is able to read short simple texts and messages dealing with familiar topics. S/he also deepens her/his understanding of the Finnish language and communication styles.

Contents:

This is lower elementary course which aims to help students to learn communication skills in ordinary everyday situations. During the course, students broaden their vocabulary and knowledge of grammar and principles of pronunciation. They also practise to understand easy Finnish talk about everyday subjects, and reading and writing short and simple texts/messages.

The topics and communicative situations covered in the course are: talking about oneself, one's family, studies and daily routines, as well as asking about these things from other person, expressing opinions, describing people and things, talking about weather and seasons, the names of the months and colours.

The structures studied are: verb types, basics of the change of the consonants k, p and t in verbs and nouns, the genitive and partitive cases, possessive structure, some declension types for nouns (word types) and the basics of the local cases.

Mode of delivery:

Contact teaching

Learning activities and teaching methods:

Lessons twice a week (26 h) and self study (24 h).

Target group:

International degree and post-graduate degree students of the University.

Prerequisites and co-requisites:

Completion of the Survival Finnish Course

Recommended optional programme components:

-

Recommended or required reading:

Gehring, S. & Heinzmann, S.: **Suomen mestari 1** (chapters 3-5)

Assessment methods and criteria:

Regular and active participation in the weekly lessons (twice a week), homework assignments and written exam at the end of the course will be observed in assessment.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Grading scale is 1-5.

Person responsible:

Anne Koskela

Working life cooperation:

-

Other information:

Sign-up in WebOodi. The course will start right after the Survival Finnish course. The lessons will be held twice a week during a 6-week period.

488400A: Orientation to the BEE studies, 0 - 1 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Kirsi *Marita Puikkonen

Opintokohteen kielet: English

ECTS Credits:

0 cr

Language of instruction:

English

Timing:

In periods 1-4 of the first BEE study year.

Learning outcomes:

After completion of the different parts of the orientation, the student is able to recognize his/her own study environment in the University of Oulu and at the department of Process and Environmental Engineering. He /she can make use of the student services of the university. He/she will be able to draft a personal study plan and schedule together with the programme Study Advisor. The student is also able to use the facilities of academic libraries. He/she will be able to access the tools needed for the studies and in every-day-life.

Contents:

Introduction to studies, overview of the services offered by the university, and the student organizations (e. g. academic sports services, student health services); Introduction to the university, faculty and departments in relation to the BEE studies; Introduction to the methods of studying and to the skills in gaining the tools needed for planning of the studies; Overview of library, Optima, etc. services. Other issues based on the needs of the individual students. Compulsory parts: 1. the Orientation Days for all new international students organized by the University of Oulu, containing an one day by the Department. 2. Orientation to the BEE master’s degree programme. 3. Participation to student tutoring during the autumn term. 4. Planning of PSP (personal study plan) and study schedule, and ratification of the BEE study option Clean Production or Water and Environment.

Mode of delivery:

Implemented mainly as face-to-face teaching, or possibly by distance learning.

Learning activities and teaching methods:

Lectures, visits, seminars, exercises, etc.

Target group:

The new students of the Master's Degree Programme (BCBU) in Environmental Engineering (BEE) only.

Prerequisites and co-requisites:

For BEE students, admission to the Master's programme, for which minimally a former bachelor's degree is required.

Recommended optional programme components:

The other courses of the Master's phase curriculum so far.

Recommended or required reading:

All materials will be delivered on need-basis (e.g. BEE-study guide book, etc.)

Assessment methods and criteria:

Active participation to all of the different parts of the course; planning the first version of the PSP together with the Study Advisor (compulsory).
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Verbal scale Passed/Failed

Person responsible:

BEE Study Advisor Marita Puikkonen (Department of Process and Environmental Engineering, University of Oulu)

Working life cooperation:

No

Other information:

This course is compulsory, even if no credits can be attained by it.

488002S: Advanced Practical Training, 3 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Advanced Studies

Laji: Practical training

Arvostelu: 1 - 5, pass, fail

Opettajat: Saara Luhtaanmäki

Opintokohteen kielet: Finnish

Leikkaavuudet:

477005S	Advanced Practical Training	5.0 op
480098A	Practice, extension	7.0 op

ECTS Credits:

3 cr

Language of instruction:

Finnish or English

Timing:

Student usually works in summer time.

Learning outcomes:

During the advanced practical training the student is exposed to his/her working environment from the point of view of his/her studies and becomes acquainted with another possible future job or with a different assignment already in a familiar working environment. The student can identify the problems associated with the working environment and can solve them. The student can apply theoretical knowledge in practical tasks. The student identifies the tasks appropriate for the Master of Science in Technology at his/her workplace.

Contents:

Suitable areas for practical training are, for example, regional environment centers, environmental engineering and consulting offices, water-works, biotechnological and food industry, chemical industry, pulp and paper industry, metallurgical and mining industry, partly electronics and automation industry, and other areas in the private and public sectors.

Mode of delivery:

Working as employee

Learning activities and teaching methods:

-

Target group:

Master’s students in DPEE

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

Student has to show original references and leave the application. In addition she/he has to participate to seminar where she/he reports own summer job. In reference must be training time period and duties. Read more about assessment criteria at the University of Oulu webpage.

Grading:

Verbal scale Passed/Failed

Person responsible:

Student advisor Saara Luhtaanmäki

Working life cooperation:

Yes.

Other information:

The objective is to give a deeper and more detailed conception of the areas where the student will possibly work after graduation. Suitable tasks would be supervision tasks and R&D tasks. Students will land the jobs themselves.

488401A: Introduction to the Barents Region, 2 op

Voimassaolo: 01.01.2009 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Kirsi *Marita Puikkonen

Opintokohteen kielet: English

ECTS Credits:

2 cr

Language of instruction:

English

Timing:

In periods 1-2 of the first BEE study year.

Learning outcomes:

The student will be able to tell where and what the Barents Region is, and describe the main environmental historical, cultural and socio-economic issues related to it including also the special technological and infrastructural factors therein, and evaluate those issues against the respective issues in his/her country of origin.

Contents:

The Barents environment; History of the Barents collaboration and the political and economic profile of the Barents Region; Infrastructure and building in the Barents Region; People, cultures and livelihoods in the Barents Region; People and health at the Barents Region, Technological challenges and possibilities in the Barents Region.

Mode of delivery:

Implemented as face-to-face teaching.

Learning activities and teaching methods:

Lectures, discussions, visits, learning diaries, final portfolio.

Target group:

Especially, but not strictly restricted to the new students of the Master's Degree Programme (BCBU) in Environmental Engineering (BEE).

Prerequisites and co-requisites:

For BEE students, admission to the Master's programme, for which minimally a former bachelor's degree is required. For other students the Bachelor level studies in process or environmental engineering or respective knowledge.

Recommended optional programme components:

The other courses of the BEE curriculum

Recommended or required reading:

Lecture materials are provided during the course and in Optima.

Assessment methods and criteria:

Participation to the lectures and visits, writing learning diaries therein, and a final portfolio.
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:

BEE Study Advisor Marita Puikkonen (Department of Process and Environmental Engineering, University of Oulu)

Working life cooperation:

No

Other information:

-

488402A: Sustainable Development, 3 op

Voimassaolo: 01.01.2009 - 31.07.2015
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: English
Leikkaavuudet:

488402S	Sustainable Development	5.0 op

ECTS Credits:

3 cr

Language of instruction:

English

Timing:

Period 3

Learning outcomes:

The student is able to explain the multi-disciplinary nature of sustainability knows the principles and guidelines of sustainable development; and is able outline the future perspectives on the prosperity of environmental, social, economic and technological systems.

Contents:

Multidisciplinary, intensive and interactive course. Presentations on (e.g.) the principles of sustainable development; environmental justice; cultural diversity; globalization and business ethics; governance for sustainable development; resource use conflicts; water scarcity, sustainable consumption; technological change and sustainable development; international cooperation and action toward sustainable development.

Mode of delivery:

Implemented as student seminar and face-to-face teaching.

Learning activities and teaching methods:

Lectures, discussions, student presentations, opponency, group work, court case simulation.

Target group:

Master’s students of environmental engineering, especially of international master’s programmes such as the Master's Degree Programme (BCBU) in Environmental Engineering (BEE).

Prerequisites and co-requisites:

For BEE students, admission to the Master's programme, for which minimally a former bachelor's degree is required. For other students the Bachelor level studies in process or environmental engineering or respective knowledge.

Recommended optional programme components:

The other courses of the BEE curriculum

Recommended or required reading:

Lecture materials are provided during the course in Optima.

Assessment methods and criteria:

Quality of student presentations, activity in discussions, performance as an opponent and in the court case simulation.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course evaluation will be based on participation and activity during the course. The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail.

Person responsible:

TkT Satu Ojala (Department of Process and Environmental Engineering, University of Oulu)

Working life cooperation:

No

Other information:

-

477307S: Research Methodology, 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Advanced Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Huuhtanen, Mika Ensio

Opintokohteen kielet: English

Leikkaavuudet:

480311S Research Methodology 3.5 op

ECTS Credits:

2 or 5 cr

Language of instruction:

English

Timing:

Implementation in autumn and spring semesters during periods 2-6

Learning outcomes:

After the course the student is able to define the role of research and different stages of research work. The student is also able to classify the stages and the subtasks of research work as well as important elements related to research, i.e. literature search, experimental work, and data processing. In addition, the student can evaluate the amount of work needed in research stages. The student can write scientific text and use references appropriately. The student also has the ability to recognise ethical issues related to research and analyse the meanings of those. He/she can use the principles of good scientific practises and is able to apply knowledge to research work.

Contents:

1) Science and research politics. 2) Research education. 3) Fundamentals of philosophy of science. 4) Starting research work: research types, funding, the process of research work, finding the research area, choosing the research topic, information sources. 5) Research plan and collecting data, experimental methods and significance of the variables, systematic experimental design, collecting experimental data, test equipment, reliability of the results, problems in laboratory experiments, modelling and simulation. 6) Mathematical analysis of results. 7) Reporting: writing a scientific text, referring, writing diploma, licentiate and doctoral theses, or reports. 8) Other issues connected to research work: ethical issues, integrity, and future. 9) Examples of scientific research in practice.

Mode of delivery:

Miniproject based on lectures in Optima during autumn term, contact lectures, laboratory training period during spring term.

Learning activities and teaching methods:

Contact lectures 6 h, miniproject 15 h, training period 70 h.

Target group:

Master's degree students of the Department of Process and Environmental Engineering.

Prerequisites and co-requisites:

None

Recommended optional programme components:

-

Recommended or required reading:

Melville, S & Goddard, W: Research Methodology; An Introduction for Science and Engineering Students. Kenwyn 1996, Juta & Co. Ltd. 167 p. Hirsijärvi, S., Remes, P. & Sajavaara, P.: Tutki ja kirjoita. Jyväskylä 2004, GummerusKirjapaino Oy. 436 p. Material introduced in the lectures.
Additional literature :Paradis, J.G. & Zimmermann, M.L.: The MIT Guide to Science and Engineering Communication, 2nd ed. Cambridge 2002, The MITPress, 324 p. Nykänen, O.: Toimivaa tekstiä, Opas tekniikasta kirjoittaville. Helsinki 2002, TekniikanAkateemistenLiitto TEK.212 p.

Assessment methods and criteria:

Optima exercises (miniproject) and laboratory training.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

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

Person responsible:

University lecturer Mika Huuhtanen

Working life cooperation:

No

Other information:

The objective of the course is tofamiliarise the student with scientific research, scientific methods and data handling, especially in process and environmental engineering. The course will give the student the basis to do the research work and motivates him/her to begin post-graduate studies. The course gives the student team working skills and increases the co-operation between the students and the research and teaching staff. The students are exposed to experiences in co-operation between different fields of science, industry, and other universities and laboratories, as well as the skills for doctoral studies.
2 cr gained when only Optima period (in autumn semester) is finalized. Full 5 cr include both Optima and training periods.

477041S: Experimental Design, 5 op

Opiskelumuoto: Advanced Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Leiviskä, Kauko Johannes
Opintokohteen kielet: English

ECTS Credits:

5 cr

Language of instruction:

English

Timing:

Implementation in 4 th period.

Learning outcomes:

After this course the student knows the main software tools for experiment design and is able to use them. He can apply the main approaches for studying and evaluating the measurement reliability.

Contents:

Determining the uncertainty of measurements in chemical, physical and biochemical measurements, measurements reliability and traceability; Calculation examples supporting the learning of measurements uncertainty assessment preparation; Experimental design software (Modde, Minilab, Matlab tools); Experimental design preparation and execution in laboratory scale research. Test methods and variable significance, reliability of experimental data; Problems in laboratory, pilot and full scale experiments, problems in modelling and in simulation.

Mode of delivery:

Lectures and practical work.

Learning activities and teaching methods:

Contact lectures

Target group:

Master's students in DPEE

Prerequisites and co-requisites:

No prerequisites

Recommended optional programme components:

-

Recommended or required reading:

Material given in the lectures.

Assessment methods and criteria:

Assessment during the course, by continuous evaluation with lecture exams, and written report of the practical work.
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 Kauko Leiviskä

Working life cooperation:

No

Other information:

-

477203A: Process Design, 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Jani Kangas

Opintokohteen kielet: English

Leikkaavuudet:

480310A	Fundamentals of Process Design	5.0 op

ECTS Credits:

5 cr

Language of instruction:

English

Timing:

Periods 4-5.

Learning outcomes:

By completing the course the student is able to identify the activities of process design and the know-how needed at different design stages. The student can utilise process synthesis and analysis tools for creating a preliminary process concept and point out the techno-economical performance based on holistic criteria.

Contents:

Acting in process design projects, safety and environmentally conscious process design. Design tasks from conceptual design to plant design, especially the methodology for basic and plant design.

Mode of delivery:

Lectures and design group exercises.

Learning activities and teaching methods:

Lectures 30h, group work 50h and self-study 50h

Target group:

Bachelor students in DPEE

Prerequisites and co-requisites:

Objectives of 477202A Reactor analysis, 477304A Separation processes and 477012 Introduction to Automation Engineering

Recommended optional programme components:

-

Recommended or required reading:

Lecture handout, Seider, W.D., Seider, J.D. and Lewin, D.R. Product and process design principles: Synthesis, analysis and evaluation. John Wiley & Sons, 2004. (Parts) ISBN 0-471-21663-1

Assessment methods and criteria:

Combination of examination and design group exercises.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Scale 1-5

Person responsible:

University Teacher Jani Kangas

Working life cooperation:

-

Other information:

-

A432276: Advanced Module/Water and Environment, 60 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Advanced Module
Laji: Study module
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Compulsory

488405S: Environmental Issues in the Barents Region, 5 op

Voimassaolo: 01.01.2009 -
Opiskelumuoto: Advanced Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: English

ECTS Credits:

3 cr

Language of instruction:

English

Timing:

Period 6

Learning outcomes:

After completing this course the students will be able to describe the environmental landscape of the Barents region, the impacts of past activities, and projections of future economic, social and technological development.

Contents:

Presentations on the environmental issues of North-Finland, North-Sweden, Northern Norway, The Republic of Karelia, Murmansk region and Arkhangelsk region. The regional presentations outline the impacts of technologies in the region, future technological developments, Northern resource exploitation projects, pollution prevention and remediation, impacts of multiple resource uses. Group works on sustainable living in the North, future technological and environmental scenarios, negotiation on conflicting resource uses, communication on technological development projects to the public and media.

Mode of delivery:

Implemented as face-to-face teaching.

Learning activities and teaching methods:

Lectures, field-trips, group works, course assignments, student presentations, role playing, negotiation simulation, pre-course ad post-course assignments.

Target group:

In University of Oulu: Especially the students of the Master's Degree Programme (BCBU) in Environmental Engineering (BEE); In addition: the students of BEE/BCBU partner universities.

Prerequisites and co-requisites:

For BEE students, admission to the Master's programme, for which minimally a former bachelor's degree is required. Please note that for participation to the course all students are required to have good English language skills! A pre-course assignment is to be completed prior to the course.

Recommended optional programme components:

The other courses of the Master's phase curriculum.

Recommended or required reading:

Lecture materials are provided during the course

Assessment methods and criteria:

Assessment is based on the performance of the different assignments, presentation of pre-course assignment, course activity, performance in group works and negotiation simulation and the submitted post-course assignment report.
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:

Eva Pongrácz (Thule Institute, University of Oulu)

Working life cooperation:

No

Other information:

Resources allowing, the course is organized intensively during one week in location outside of Oulu, at the Oulanka Research Station, Kuusamo Finland as part of the BCBU cooperation. Alternatively, the course is organized e.g. at the University of Oulu, Finland. Good communication skills in English are necessary requirement of participation in the course!

488102A: Hydrological Processes, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

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 cr

Language of instruction:

Finnish, self-study package in English

Timing:

The course unit is held in the spring semester, during periods 4-5 but the self-study package in English cab be done in periods 1-6.

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 relation 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, open channel flow, flow in pipe systems.

Mode of delivery:

Face-face teaching in Finnish, self-study package in English

Learning activities and teaching methods:

For self-study package course, 4 tutor sessions are arranged during the semester.

Target group:

Students in international programs of environmental engineering

Prerequisites and co-requisites:

No

Recommended optional programme components:

The course is a prerequisite for 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, 3 rd Edition, ISBN 0-07-020509-4)

Assessment methods and criteria:

Both hydrology and hydraulics 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 assignments (80%) and examination (20%).
Read more about assessment criteria at the University of Oulu webpage.

Grading:

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

Person responsible:

University Lecturer A-K Ronkanen

Working life cooperation:

No

Other information:

-

488104A: Industrial and municipal waste management, 5 op

Voimassaolo: 01.08.2005 - 31.07.2017

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Elisangela Heiderscheidt

Opintokohteen kielet: English

Leikkaavuudet:

480160S Waste Management of Communities and Industry 5.0 op

ECTS Credits:

5 cr

Language of instruction:

English

Timing:

The course unit is held in the spring semester, during periods 5-6

Learning outcomes:

The student will acquire a wilder view of what is waste and how it is generated and managed in communities and industries. Student will be familiar with waste management hierarchy and how waste legislation regulates waste management. She/he will get basic knowledge about waste treatment methods including their sustainability and related environmental impacts. As well as, how a series of factors influence the planning of waste management activities in industries and municipalities. The student will also be able to understand the energy and material recovery potential within the waste sector.

Contents:

Waste management hierarch, waste prevention principle, municipal waste management, waste management in industries, waste legislation, municipal and industrial waste treatment methods, international treaties related to waste management (Basel convention and Clean Development Mechanism projects: carbon trading), waste to energy principle.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Learning methods: A) Active learning method: Lectures (24 h), group work (45 h), self-study for examination (55,5 h) and field visits (8 h) or alternatively B) Group work (45 h), self-study for examination (87,5 h).

Target group:

Students in bachelor program of environmental engineering

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Lecture hand-outs, notes and other materials delivered in lectures. Waste management: a reference handbook illustrated edition, 2008 (electronic book, ISBN 9781598841510).

Assessment methods and criteria:

The students' performance during the course is assessed by successful completion of stages A and B as follow: A) Completion of the course work which consists of group exercises 1 and 2 each carrying 30% weight in the course final grade; B) Course examination carrying 40% weight in the course final grade (Note that a passing grade (1-5) for the course examination is required for the completion of the course). 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:

Reseacher Elisangela Heiderschedt

Working life cooperation:

No

Other information:

-

488108S: Groundwater Engineering, 5 op

Voimassaolo: - 31.07.2017

Opiskelumuoto: Advanced Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Björn Klöve

Opintokohteen kielet: English

Leikkaavuudet:

480122A Groundwater Technology 5.0 op

ECTS Credits:

5 cr

Language of instruction:

English

Timing:

The course unit is held in the autumn semester, during periods 1-2

Learning outcomes:

Upon completion of the course, the student will have knowledge on water retention and flow in soils, basic theories about hydraulics of groundwater systems, groundwater quality, groundwater use and modelling. Students learn to define hydraulic characteristics of soil and aquifers. After the course students are able to estimate key factors influencing on discharge and water quality of groundwater and to use general methods to calculate groundwater flow. They also know how to plan, manage, and protect groundwater resources in a sustainable way.

Contents:

Soil and groundwater, water balance, hydraulic properties of soils, formation of groundwater, flow equations and solutions, pumping tests and methods, groundwater quality and modelling.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 10 h, calculus exercises 9 h, MODFLOW modelling exercises 16 h, modelling report 40 h, and self-study 60 h.

Target group:

Master students in the water engineering orientation of the Environmental Engineering program

Prerequisites and co-requisites:

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

Recommended optional programme components:

-

Recommended or required reading:

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

Assessment methods and criteria:

Modelling assignment (40 % of the grade) and exam (60 % of the grade).
Read more about assessment criteria at the University of Oulu webpage.

Grading:

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

Person responsible:

Professor Björn Klöve and Researcher Pekka Rossi

Working life cooperation:

No

Other information:

The course is arranged in alternate years (odd autumn semesters).

488110S: Water and Wastewater Treatment, 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Advanced Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Leikkaavuudet:

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

ECTS Credits:

5 cr

Language of instruction:

English

Timing:

The course unit is held in the autumn semester, during periods 1-2

Learning outcomes:

Upon completion of the course, the student will be able to explain basic processes of water and wastewater treatment and can do the selection of needed process units and can dimensioning those.

Contents:

Characters of raw water, tap water and wastewater; used process units in water and waste water treatment; selection of process units; dimensioning treatment units and unit processes.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

lectures (50 h), exercises (40 h), self-study (45 h)

Target group:

Students in master program of environmental 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: 488011P Introduction to Environmental Engineering

Recommended optional programme components:

-

Recommended or required reading:

Lecture hand-outs & Kemira, About water treatment. 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:

Course can be completed A) by book examination (Kemira), the lecture examination and to do 2 exercises OR B) by the final examination and to do 2 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:

Laboratory Engineer Jarmo Sallanko

Working life cooperation:

No

Other information:

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488118S: Laboratory Exercises and Field Measurements in Environmental Engineering, 10 op

Voimassaolo: 01.08.2010 -
Opiskelumuoto: Advanced Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Ali Torabi Haghighi
Opintokohteen kielet: English

ECTS Credits:

10 cr

Language of instruction:

English

Timing:

The course unit is held during periods 1-6

Learning outcomes:

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

Contents:

Units of measurements, Error and mistake in laboratory works and field measurements. Laboratory works on Fluid mechanics and open channel hydraulics contain different method for discharge measurement, Bernoulli equation, Momentum equation, gates and wires, hydraulic jump and tracer test. Laboratory works on Geotechnical and Geoenvironmental Engineering contain sieving test, hydrometer test, Atterberg limits test, proctor test, direct shear box test and eudiometer test. Laboratory works on Ground water engineering contain hydraulic conductivity (K), specific yield (S), porosity (n) and PF curve test , Darcy low and groundwater flow, contaminant transport. Laboratory works on water and waste water engineering contain Jar test experiment, settling velocity , limestone ($CaCO_3$) filtration, aeration determination of Fe, Cl-, Mn. Introduction to surveying and preparing a topography map, Global position system (GPS), soil and water sampling, CO_2 measurements from soil. Field measurement experiences in cold climate

Mode of delivery:

Face-to-face teaching, laboratory working.

Learning activities and teaching methods:

Activating learning method: Lectures (30 h), group work (240 h)

Target group:

Only for master students in the water engineering orientation of the Environmental Engineering program

Prerequisites and co-requisites:

The required prerequisite is the completion of the following courses prior to enrolling for the course unit: 488102A Hydrological Processes, 488108S Groundwater Engineering, 488110S Water and Wastewater Treatment, 488115S Geomechanics, 488113S Introduction to Surface Water Quality Modelling

Recommended optional programme components:

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Recommended or required reading:

Field measurements and Laboratory work instruction, lectures

Assessment methods and criteria:

Each exercise is evaluated graded on the scale 1-5. The final grade of the course is weighted average of following parts: participate in the lectures (10%), participate in the laboratory and field works (20% if the respective report will be presented), assignments (8%), and reports (62%).
Read more about assessment criteria at the University of Oulu webpage.

Grading:

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

Person responsible:

University Teacher Ali Torabi Haghighi

Working life cooperation:

No

Other information:

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Optional, choose 29 ECTS

488103A: Environmental Impact Assessment, 4 - 8 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Björn Klöve
Opintokohteen kielet: English
Leikkaavuudet:

488133A Environmental Impact Assessment 5.0 op

ay488103A Environmental Impact Assessment (OPEN UNI) 5.0 op

480170S Environmental Impact Assesment and Diminishing Harmful Effects in Water Resource Management 5.0 op

ECTS Credits:

4 or 8 cr

Language of instruction:

English

Timing:

The course unit is held in the autumn semester, during periods 1-4

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 and presentation 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 and social sciences.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

The whole course contains lectures 18 or 32 h, independent works (assignments and learning diaries, 90 or 175 h and seminars 0 or 9 h. Totally 108 h or 216 h

Target group:

Master students in the Environmental Engineering study program

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: 488011P Introduction to Environmental Engineering

Recommended optional programme components:

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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 course includes 5 modules, which are evaluated separately (with the scale 1-5). The first module is 4 ECTS credits and it is requisite for next modules. Other modules are 4 ECTS credits including seminar. The final grade of the course is weighted average of modules. Credit points of the modules are used as a weighted factor. Assessment methods of modules vary including learning diaries and different kind of assignments. More information about assessment methods of each module is given during the course. Read more about assessment criteria at the University of Oulu webpage.

Grading:

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

Person responsible:

Professor Björn Klöve

Working life cooperation:

No

Other information:

The course is arranged in alternate years (even autumn semesters). The course is organised in a co-operation with faculty of Technology, the company Pöyry Finland Oy, and the Thule institute.

488113S: Introduction to Surface Water Quality Modelling, 5 op

Voimassaolo: - 31.07.2017

Opiskelumuoto: Advanced Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Anna-Kaisa Ronkanen

Opintokohteen kielet: English

Leikkaavuudet:

480210S	Environmental Impacts of Industrial Effluents	5.0 op

ECTS Credits:

5 cr

Language of instruction:

English

Timing:

The course unit is held in the autumn semester, during periods 2-3

Learning outcomes:

The student knows the main transport mechanisms and will be able to model water quality in lakes and streams. The students will be able to use Matlab in environmental analysis, modeling and programming.

Contents:

Introduction to modelling in water resources planning, environmental hydraulics, open channel flow, lake hydraulics, processes and water quality, dimensional analysis, hydraulic experiments, transport of conservative and reactive solutes in rivers. Modelling with ordinary differential equations, fully mixed systems, analytical and numerical methods for surface water modelling. Parameter estimation and uncertainty. Tracer tests and measurements systems.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 25 h, exercises by Matlab 16 h, self-studies 94 h. Totally 135 h.

Target group:

Master students in the water engineering orientation of the Environmental Engineering program

Prerequisites and co-requisites:

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

Recommended optional programme components:

Matlab courses are recommended before the course unit.

Recommended or required reading:

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

Assessment methods and criteria:

Totally 4 assignments and examination must be done and are graded on the scale 1-5. The final grade of the course is average grade of them.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

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

Person responsible:

University Lecturer Anna-Kaisa Ronkanen

Working life cooperation:

No

Other information:

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

488117S: Water Resources Management, 5 - 7,5 op

Voimassaolo: - 31.07.2017

Opiskelumuoto: Advanced Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Ali Torabi Haghighi, Hannu Marttila

Opintokohteen kielet: English

Leikkaavuudet:

480170S Environmental Impact Assesment and Diminishing Harmful Effects in Water Resource Management 5.0 op

480212S Environmental Construction 3.5 op

ECTS Credits:

5 cr

Language of instruction:

English

Timing:

The course unit is held in the autumn semester, during periods 3-4

Learning outcomes:

This course introduces design concepts and principles that must be taken into account in planning of sustainable use of water resources. After the course students understand different processes, principles and mathematical methods used to manage water resources issues.

Contents:

Different water uses and interests, hydropower and dam engineering, irrigation and drainage, flood control and management, river restoration cases, sediment transport problems, peatland land use, acid sulphate soils, optimization and simulation, lake restoration, socio-ecological aspects in water resources.

Mode of delivery:

Face-to-face teaching, assignments

Learning activities and teaching methods:

Variable learning methods: lectures and assignments

Target group:

Master students in the water engineering orientation of Environmental Engineering program

Prerequisites and co-requisites:

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

Recommended optional programme components:

-

Recommended or required reading:

Water Resources Systems Planning and Management: An Introduction to Methods, Models and Applications. (Loucks and van Beek, 2005, ISBN 92-3-103998-9)

Assessment methods and criteria:

Variable assessment methods where each submission is graded and weighted separately: Assignment 1 (30%), Assignment 2 (20%) and Assignment 3 (50%). More detailed instructions will be given in the course. 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:

D.Sc.(Tech.) Hannu Marttila and University Teacher Ali Torabi Haghighi

Working life cooperation:

No

Other information:

The course is arranged in alternate years (odd autumn semesters).

488122S: Statistical Methods in Hydrology, 5 op

Voimassaolo: 01.08.2011 - 31.07.2017

Opiskelumuoto: Advanced Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Björn Klöve, Pertti Ala-Aho

Opintokohteen kielet: English

ECTS Credits:

5 cr

Language of instruction:

English

Timing:

The course unit is held in the autumn semester, during periods 2-3

Learning outcomes:

By completing the course, students will be able to explain and apply the general statistical methods used in hydrology. Students can understand for describing a relationship between two hydrologic variables what type of statistical analyses are mostly used. In addition, students can show their findings from the statistical methods analysing in different plot types which are conventional in hydrology and water resources management. Considering some scientific guidelines for writing the reports of assignments, students can be familiar with scientific writing much more than the past.

Contents:

Statistical analyses of a hydrologic variable: 1) Summary statistics like mean, maximum, minimum, median, standard deviation and etc. 2) Probability distributions such as histograms, box, quantile and plots of normal, gamma, log-normal and generalized extreme value distributions. 3) Analyzing and plotting of significant correlations between a hydrologic variable and a meteorological variable. 4) Using regression line model with 95% confidence and prediction intervals, and also check residuals of the model. 5) Trend and time series analysis, and plotting time versus data in anomaly and scatter plots.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

In total, 135 hours of learning activities consisting of lectures (9 h), instructed computer sessions (18 h), and return assignments (108 h)

Target group:

Master students in the water engineering orientation of the Environmental Engineering program

Prerequisites and co-requisites:

The required prerequisite is the completion of the following course prior to enrolling for the course unit: 488102A Hydrological Processes, and 477033A Programming in Matlab or corresponding Matlab skills

Recommended optional programme components:

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Recommended or required reading:

Helsel, D.R., & Hirsch, R.M., 2002. Statistical Methods in Water Resources (available online). Loucks, D. P., van Beek, E., Stedinger, J.R., Dijkman J.P.M., Villars, M.T., 2005. Water Resources Systems Planning and Management (available online).

Assessment methods and criteria:

Variable assessment methods where each submission is graded an weighted separately: A) report of group work on assignments (3 return assignments in total 75%), and B) final exam (25%)
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Final grade of the course is average of assignments and final exam. In the numerical scale zero stands for a fail.

Person responsible:

Professor Björn Klöve

Working life cooperation:

No

Other information:

The course is arranged in alternate years (odd autumn semesters).

488123S: River Engineering and Hydraulic Structures, 5 op

Voimassaolo: 01.08.2011 -
Opiskelumuoto: Advanced Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Ali Torabi Haghighi
Opintokohteen kielet: English

ECTS Credits:

5 cr

Language of instruction:

English

Timing:

The course unit is held in the autumn semester, during periods 3-4

Learning outcomes:

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

Contents:

Review of hydrology, open channel hydraulics and fluid mechanics, General Requirements and Design Considerations, Conveyance structures, Water storage structures, Protective structures, Regulating structures, Water measurement structures, Energy Dissipators, Hec-Ras software in hydraulic structure design.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Activating learning method: Lectures (24 h), group work (35 h), independent work (30 h), self-study (40 h) and seminar (3 h)

Target group:

Master students in the water engineering orientation of the Environmental Engineering program

Prerequisites and co-requisites:

The required prerequisite is the completion of the following courses prior to enrolling for the course unit: 488102A Hydrological Processes, 488117S Water Resources Management, 488106A Basics in Environmental Geotechnics, 488108S Groundwater Engineering

Recommended optional programme components:

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

Recommended or required reading:

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

Assessment methods and criteria:

Modelling wit river analysis software (25%), assignment (25%), River engineering project (20%), Hydraulic structure project and presentation
Read more about assessment criteria at the University of Oulu webpage.

Grading:

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

Person responsible:

Professor Björn Klöve and University Teacher Ali Torabi Haghighi

Working life cooperation:

No

Other information:

The course will be organised first time in the autumn semester 2014

488124S: Advanced Course in Hydrology, 5 op

Voimassaolo: 01.08.2011 - 31.07.2017

Opiskelumuoto: Advanced Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Björn Klöve

Opintokohteen kielet: English

ECTS Credits:

5 cr

Language of instruction:

English

Timing:

The course unit is held in the autumn semester, during periods 1-2

Learning outcomes:

In depth knowledge on hydrology.

Contents:

Hydrological processes, evapotran-spiration, snow accumulation and melt, climate variability and extreme events, rainfall-runoff modelling.

Mode of delivery:

not defined

Learning activities and teaching methods:

Guided and independent process studies and modelling.

Target group:

Master students in the water engineering orientation of Environmental Engineering program

Prerequisites and co-requisites:

The required prerequisite is the completion of the following course prior to enrolling for the course unit: 488102A Hydrological Processes, 488122S Statistical Methods in Hydrology

Recommended optional programme components:

-

Recommended or required reading:

-

Assessment methods and criteria:

-

Read more about assessment criteria at the University of Oulu webpage.

Grading:

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

Person responsible:

Professor Björn Klöve

Working life cooperation:

No

Other information:

The course will be organised first time in the autumn semester 2014

488131S: Geoenvironmental Engineering, 5 op

Voimassaolo: 01.08.2013 -

Opiskelumuoto: Advanced Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Kauko Kujala

Opintokohteen kielet: Finnish

Leikkaavuudet:

485306S	Geoenvironmental Engineering	5.0 op

ECTS Credits:

5 cr

Language of instruction:

Finnish

Timing:

The course unit is held in the autumn semester during periods 1-2

Learning outcomes:

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

Contents:

Norms and instructions, there will be a project work where student will be discover a contaminated soil and a proposal remediation technique, Properties of soil material and industrial by-products, basis of geotechnical design to landfill environment, challenges of mining

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures (20 h), group work (60 h) and independent work (55 h)

Target group:

Students in Master program of Water and Geoenvironmental Engineering

Prerequisites and co-requisites:

488115A Geomechanics

Recommended optional programme components:

-

Recommended or required reading:

Handout and other materials delivered in lectures

Assessment methods and criteria:

-

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 Kauko Kujala

Working life cooperation:

No

Other information:

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480429S: Maturity Test / Environmental Engineering, 0 op

Opiskelumuoto: Advanced Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Tutkintorakenteisiin kuulumattomien opintokokonaisuuksien ja -jaksojen kuvaukset

030001P: Orientation Course for New Students, 1 op

Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Faculty of Technology
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

477000P	Planning of Studies and Career	1.0 op

Ei opintojaksokuvauksia.