Opasraportti

Department of Industrial Engineering and Management (2013 - 2014)

Tutkintorakenteet

Msc. Engineering, Industrial Engineering and Management

Tutkintorakenteen tila: archived

Lukuvuosi: 2013-14

Lukuvuoden alkamispäivämäärä: 01.08.2013

THE STRUCTURE OF THE DEGREE PROGRAMME IN INDUSTRIAL ENGINEERING AND MANAGEMENT, MASTER OF SCIENCE (TECHNOLOGY) 120 ECTS

Modules of the Options (at least 60 ECTS)

- Obligatory Module for all IEM students (30 ECTS)
- Advanced Module of the Option (at least 30 ECTS)

Supplementary Module (Technical Engineering Studies) (at least 20 ECTS)

Elective studies (10 ECTS)

Master's Thesis (30 ECTS)

1. Choose one of the Advanced Modules of the Option

1. Usability Design and Management of Well-Being at Work
2. Quality and Project Management
3. Production Management
4. Management of Product Development.

2. Choose Supplementary Module (Technical Engineering Studies)

3. Schedule your studies.

4. Plan and schedule your elective studies.

Module of the Option, obligatory (vähintään 30 op)

Compulsory module for all IEM students.

The students studying the option Usability Design and Management of Well-Being at Work choose the course 555363S Creativity at work and in product development. All the others choose the course 555342S Operations Research.

Module of the Option

A440221: Module of the Option, obligatory, 30 op

Advanced Module, of Option/Usability Design and Management of Well-Being at Work (vähintään 30 op)

Usability Design and Management of Well-Being at Work, obligatory

A440222: Usability Design and Management of Well-Being at Work, Advanced Module, 30 op
   Electives
      555361A: Machine Safety and Usability, 3,5 op
      555362S: Safety in Process Industry, 5 op
      555364S: Ergonomics, 5 op
      555366S: Chemical and Physical Hazards in Industrial Environments, 3 op
      555367S: Exercises in Work Science, 6 op
      721614A: Labour Law, 7 op

Usability Design and Management of Well-Being at Work, optional studies

A440223: Module of the Option/ Usability Design and Management of Well-Being at Work, Optional, 3 - 13 op

Advanced Module of Quality and Project Management (vähintään 30 op)

Choose at least 30 ECTS,

A440224: Module of the Option/Quality and Project Management, Advanced Module, 30 - 40 op
   Electives
      555382S: Project Business, 5 op
      555381S: Project Leadership, 5 op
      555322S: Production Management, 3 op
      555323S: Sourcing Management, 3 op
      555324S: Advanced Supply Chain Management, 3 op
      555385S: Advanced Course in Quality Management, 5 op
      555386S: Advanced Course in Project Management, 5 op
      555387S: Project Work in Quality Management, 5 op
      555388S: Project Work in Project Management, 5 op
      555345S: Advanced Course in Product Development, 6 op

Module of the Option, Production Management, Advanced Module (vähintään 30 op)

Choose at least 30 ECTS.

A440226: Module of the Option/ Production Management, Advanced Module, 30 - 40 op
   Choose 555326S Research project in production management or 555327S Seminar in production management.
      555326S: Research Project in Production Management, 5 op
      555327S: Seminar in Production Management : Lab to Market, 5 op
   Electives
      555322S: Production Management, 3 op
      555323S: Sourcing Management, 3 op
      555324S: Advanced Supply Chain Management, 3 op
      555344S: Management Information Systems, 5 op
      555341S: Productivity and Performance Management, 3 op
      555381S: Project Leadership, 5 op

555346S: Product management, 5 op

Advanced Module, Management of Product Development (vähintään 30 op)

Choose at least 30 credits.

Choose the course 555347S Seminar in product development management or the course 555348S Research project in product development management.

A440225: Module of the Option/ Management of Product Development, Advanced Module, 30 - 40 op

Supplementary Module, Mechanical Engineering (vähintään 20 op)

Continue technical studies you started during bachelor degree.

Plan and choose courses to get at least 20 ECTS to your module of Mechanical Engineering.

A440255: Supplementary Module, Mechanical Engineering, 20 - 30 op

Supplemantary Module, Civil Engineering (vähintään 20 op)

Continue technical studies you started during bachelor degree.

Plan and choose courses to get at least 20 ECTS to your module of Civil Engineering.

A440248: Supplementary Module, Structural Engineering and Construction Technology, 20 - 30 op

Supplementary Module, Process Engineering (vähintään 20 op)

Continue technical studies you started during bachelor degree.
Plan and choose courses to get at least 20 ECTS to your module of Process Engineering.

A440249: Supplementary Module, Process Engineering, 20 - 30 op

Supplementary Module, Environmental Engineering (vähintään 20 op)

Continue technical studies you started during bachelor degree.

Plan and choose courses to get at least 20 ECTS to your module of Environmental Engineering.

A440256: Supplementary Module, Environmental Engineering, 20 - 30 op

Supplementary Module: Electrical Engineering (vähintään 20 op)

Continue technical studies you started during bachelor degree.

Plan and choose courses to get at least 20 ECTS to your module of Electrical Engineering.

A440253: Supplementary Module, Electronics and Communications Engineering, 20 - 30 op

Supplementary Module, Information Engineering (vähintään 20 op)

Continue technical studies you started during bachelor degree.

Plan and choose courses to get at least 20 ECTS to your module of Information Engineering.

A440254: Supplementary Module, Information, 20 - 30 op

Elective Studies (enintään 10 op)

Master level studies include maximum 10 ECTS elective studies. Students choose courses that supplement or deepen the competencies of Industrial Engineering and Management.

Courses with same content cannot be included twice to the degree programmes in Industrial Engineering and Management.

A440273: Special Module, 10 op

Master's Thesis (30 op)

Master's Thesis

470099S: Master's Thesis in Industrial Engineering and Management, 30 op
555312S: Maturity Test / Industrial Engineering and Management, 0 op

Bachelor, Industrial Engineering and Management

Tutkintorakenteen tila: archived

Lukuvuosi: 2013-14

Lukuvuoden alkamispäivämäärä: 01.08.2013

THE STRUCTURE OF THE DEGREE PROGRAMME IN INDUSTRIAL ENGINEERING AND MANAGEMENT, BACHELOR OF SCIENCE (TECHNOLOGY) 180 ECTS

Basic and intermediate studies (120 ECTS)

Modules preparing for the options (at least 40 ECTS)

The modules include the technical engineering studies of the Bachelor's degree programme. A student must choose the the module of Engineering.

Elective studies (10 ECTS)

Bachelor's thesis and the studies included (10 ECTS)

Basic and Intermediate Studies (vähintään 120 op)

- Choose the language in which you have a long high school course curriculum.
- You can choose which of the two courses of 521141P Elementary Programming or 811192P Introduction to Programming in C you take. If you are going to study Electrical or Information Engineering, take the course 521141P Elementary Programming.
- Choose the option 4,5 ECTS of the Course 555220P Basic Course in Industrial Engineering and Management.

A440120: Basic and Intermediate Studies, Industrial Engineering and Management, 119,5 - 120 op
    Compulsory to all
        555212P: Orientation Course for New Students, 1 op
        030005P: Information Skills, 1 op
        031010P: Calculus I, 5 op
        031011P: Calculus II, 6 op
        031017P: Differential Equations, 4 op
        031019P: Matrix Algebra, 3,5 op
        031021P: Probability and Mathematical Statistics, 5 op
        761121P: Laboratory Exercises in Physics 1, 3 op
        761101P: Basic Mechanics, 4 op

761103P: Electricity and Magnetism, 4 op
761104P: Wave Motion, 3 op
721172P: Management Accounting, 5 op
721210P: Economics for Business, 5 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
555221P: Introduction to Production, 2 op
555262A: Usability and Safety in Product Development, 3 op
555263A: Technology, Society and Work, 2 op
555240A: Basic Course in Product Development, 3 op
555223A: Introduction to Production Control, 3 op
555224A: Methods of Production Management and Logistics, 4 op
721704A: Business Logistics, 5 op
555210A: Practice, 3 op
555284A: Problem Solving in Business Cases, 3 op
555222A: Demonstration in Industrial Engineering and Management, 2 op
555281A: Basic Course of Quality Management, 5 op
555282A: Project Management, 4 op
555261A: Basic Course in Occupational Psychology, 3 op
721412P: Product and Market Strategies, 5 op
900062P: Communicative Oral Skills for Production Engineering and Management, 2 op
Choose one of these
902011P: Technical English 3, 6 op
903012P: Technical German 3, 6 op
Choose one of them
901008P: Second Official Language (Swedish), 2 op
900009P: Second Official Language (Finnish), 2 op
Choose here 521141P Elementary Programming or 811192PIntroduction to Programming in C
521141P: Elementary Programming, 5 op
811192P: Introduction to Programming in C, 5 op

Modules preparing for the options, Mechanical Engineering (vähintään 40 op)

The studies in Mechanical Engineering

- The module of compulsory studies (21 ECTS credits)
- The module of elective studies (at least 19 ECTS credits)

Students are required to design their elective studies to support them to complete their compulsory studies in Mechanical Engineering and/or to deepen their acquired skills as well as to prepare them for the DI-phase studies in Mechanical Engineering.

Compulsory Studies of Mechanical Engineering

A440121: Module Preparing for the Option, Mechanical Engineering (obligatory studies), 20 - 21 op
Compulsory Studies of Mechanical Engineering
461016A: Statics, 5 op
463052A: Introduction to Manufacturing Technology, 5 op
461018A: Dynamics, 4 op
461010A: Strength of Materials I, 7 op

Optional Studies of Mechanical Engineering

A440122: Module Preparing for the Option, Mechanical Engineering (optional studies), 19 - 20 op
Electives
461011A: Strength of Materials II, 7 op
464055A: Machine Design I, 8 op
464051A: Machine Drawing, 3,5 op
463053A: Manufacturing Technology I, 3,5 op
465061A: Materials Engineering I, 5 op
555361A: Machine Safety and Usability, 3,5 op

> 461033A: Finite Element Methods I, 3,5 op
> 462021A: Machine Automation I, 5 op
> 465077A: Welding Technology, 3,5 op
> 464056A: Machine Design II, 6 op
> 464061A: Techniques of Creative Working, 3 op
> 465071A: Introduction to Materials Science, 3,5 op
> 465095A: Sheet Metal Forming, 3,5 op
> 463058A: Foundry Technology, 3,5 op
> 464052A: CAD, 3,5 op
> 464087A: Maintenance Technology, 5 op

Modules preparing for the options, Civil Engineering (vähintään 40 op)

The studies in Civil Engineering

- The module of compulsory studies (24 ECTS)
- The module of elective studies (16 ECTS)

Students are required to design their elective studies to support them to complete their compulsory studies in Civil Engineering and/or to deepen their acquired skills as well as to prepare them for the DI-phase studies in Civil Engineering.

Compulsory studies of Civil Engineering

A440123: Module Preparing for the Option, Civil Engineering (obligatory studies), 22,5 - 24 op
Compulsory Studies of Civil Engineering
> 461016A: Statics, 5 op
> 461010A: Strength of Materials I, 7 op
> 460118A: Building Materials, 3 op
> 460117A: Introduction to Structural Design, 6 op
> 460116A: Introduction to Building Construction, 3 op

Optional Studies of Civil Engineering

A440124: Module Preparing for the Option, Civil Engineering (optional studies), 16 - 17,5 op
Electives
> 463052A: Introduction to Manufacturing Technology, 5 op
> 460165A: Introduction to Construction Economics I, 3 op
> 461011A: Strength of Materials II, 7 op
> 461033A: Finite Element Methods I, 3,5 op
> 460125A: Introduction to Design of Steel Structures, 4 op
> 460135A: Introduction to Structural Timber Design, 4 op
> 460147A: Introduction to Design of Concrete Technology, 4 op
> 460145A: Concrete Structures, 6 op

Modules preparing for the options, Process and Environmental Engineering (vähintään 40 op)

The studies in Process and Environmental Engineering

- The module of compulsory studies in Process and Environmental Engineering (20 ECTS credits) and
- The module of elective studies in Process Engineering (20 ECTS credits) or
- The module of elective studies in Environmental Engineering (20 ECTS credits).

Students are required to design their elective studies to support them to complete their compulsory studies in Process and Environmental Engineering and/or to deepen their acquired skills as well as to prepare them for the DI-phase studies in Process Engineering or in Environmental Engineering.

Compulsory Studies of Process and Environmental Science

A440135: Module Preparing for the Option, Process and Environmental Engineering (obligatory studies), 20 op

Compulsory Studies of Process and Environmental Engineering
    477011P: Introduction to Process and Environmental Engineering I, 5 op
    488010P: Introduction to Process and Environmental Engineering II, 5 op
    477201A: Material and Energy Balances, 5 op
    477401A: Thermodynamic Equilibria, 5 op

Optional Studies of Process Engineering

A440136: Module Preparing for the Option/Process and Environmental Engineering (optional studies), Process Engineering (optional studies), 20 op
    Optional Studies of Process Engineering
        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
        477103A: Bioproduct Technology, 3 op
        477501A: Process Control Engineering I, 5 op
        477502A: Process Control Engineering II, 5 op
        477601A: Process Automation Systems, 4 op
        488102A: Hydrological Processes, 5 op
        488103A: Environmental Impact Assessment, 4 - 8 op
        488104A: Industrial and municipal waste management, 5 op
        488012A: Environmental Legislation, 5 op
        488201A: Environmental Ecology, 5 op

Optional Studies of Environmental Engineering

A440138: Module Preparing for the Option/Process and Environmental Engineering (optional studies), Environmental Engineering (optional studies), 20 op
    Optional Studies of Environmental Engineering
        477301A: Momentum Transfer, 3 op
        477302A: Heat Transfer, 3 op
        477303A: Mass Transfer, 3 op
        477202A: Reactor Analysis, 4 op
        477501A: Process Control Engineering I, 5 op
        477502A: Process Control Engineering II, 5 op
        477601A: Process Automation Systems, 4 op
        477101A: Particle Technology, 3 op
        477102A: Bulk Solids Handling, 4 op
        477103A: Bioproduct Technology, 3 op
        488012A: Environmental Legislation, 5 op
        488102A: Hydrological Processes, 5 op
        488103A: Environmental Impact Assessment, 4 - 8 op
        488104A: Industrial and municipal waste management, 5 op
        488201A: Environmental Ecology, 5 op

Modules preparing for the options, Electrical and Information Engineering (vähintään 40 op)

The studies in Electrical and Information Engineering

- The module of compulsory studies in Electrical and Information Engineering (20 ECTS credits) and
- The module of elective studies in Electrical Engineering (20 ECTS credits) or
- The module of elective studies in Information Engineering (20 ECTS credits).

Students are required to design their elective studies to support them to complete their compulsory studies in Electrical and Information Engineering, and/or to deepen their acquired skills as well as to prepare them for the DI-phase studies in Electrical Engineering or in Information Engineering.

Compulsory Studies of Electrical and Information Engineering

A440139: Module Preparing for the Option/Electrical and Information Engineering, 20 op
>
> *Compulsory*
>> 521109A: Electrical Measurement Principles, 5 op
>> 521142A: Embedded Systems Programming, 5 op
>> 521267A: Computer Engineering, 4 op
>> 521412A: Digital Techniques 1, 6 op

Optional Studies of Electrical Engineering

A440129: Module Preparing for the Option, Electrical Engineering (optional studies), 16 op
>
> *Electives*
>> 031018P: Complex Analysis, 4 op
>> 031050A: Signal Analysis, 4 op
>> 031022P: Numerical Analysis, 5 op
>> 031023P: Mathematical Structures for Computer Science, 5 op
>> 521104P: Introduction to Material Physics, 5 op
>> 521205A: Principles of Semiconductor Devices, 4,5 op
>> 521209A: Electronics Components and Materials, 2 op
>> 521218A: Introduction to Microfabrication Techniques, 4 op
>> 521302A: Circuit Theory 1, 5 op
>> 521306A: Circuit Theory 2, 4 op
>> 521431A: Principles of Electronics Design, 5 op
>> 521432A: Electronics Design I, 5 op
>> 521337A: Digital Filters, 5 op
>>
>> *Compulsory*
>>> 521337A-01: Digital filters, partial credit, 0 op
>>> 521337A-02: Digital filters, partial credit, 0 op
>> 521359A: Telecommunication Engineering 1, 2,5 op
>> 521361A: Telecommunication Engineering II, 3 op
>> 521340S: Communications Networks I, 5 op
>> 521316A: Broadband Communications Systems, 4 op
>> 521384A: Basics in Radio Engineering, 5 op
>> 521453A: Operating Systems, 5 op
>> 521457A: Software Engineering, 5 op
>> 521275A: Embedded Software Project, 8 op
>> 521144A: Algorithms and Data Structures, 6 op
>> 521145A: Human-Computer Interaction, 5 op
>> 521150A: Introduction to Internet, 5 op
>> 521467A: Digital Image Processing, 5 op
>>
>> *Compulsory*
>>> 521467A-01: Digital image processing, exam, 0 op
>>> 521467A-02: Digital image processing, Exercise work, 0 op
>> 521484A: Statistical Signal Processing, 5 op
>> 521495A: Artificial Intelligence, 5 op
>> 812346A: Object Oriented Analysis and Design, 6 op

Optional Studies of Information Engineering

A440134: Module Preparing for the Option, Information Engineering (optional studies), 20 op
>
> *Electives*
>> 031018P: Complex Analysis, 4 op
>> 031050A: Signal Analysis, 4 op
>> 031022P: Numerical Analysis, 5 op
>> 031023P: Mathematical Structures for Computer Science, 5 op
>> 521104P: Introduction to Material Physics, 5 op
>> 521205A: Principles of Semiconductor Devices, 4,5 op
>> 521209A: Electronics Components and Materials, 2 op
>> 521218A: Introduction to Microfabrication Techniques, 4 op
>> 521302A: Circuit Theory 1, 5 op
>> 521306A: Circuit Theory 2, 4 op
>> 521431A: Principles of Electronics Design, 5 op
>> 521432A: Electronics Design I, 5 op
>> 521337A: Digital Filters, 5 op

Compulsory
    521337A-01: Digital filters, partial credit, 0 op
    521337A-02: Digital filters, partial credit, 0 op
521359A: Telecommunication Engineering 1, 2,5 op
521361A: Telecommunication Engineering II, 3 op
521340S: Communications Networks I, 5 op
521316A: Broadband Communications Systems, 4 op
521384A: Basics in Radio Engineering, 5 op
521453A: Operating Systems, 5 op
521457A: Software Engineering, 5 op
521275A: Embedded Software Project, 8 op
521144A: Algorithms and Data Structures, 6 op
521145A: Human-Computer Interaction, 5 op
521150A: Introduction to Internet, 5 op
521467A: Digital Image Processing, 5 op
Compulsory
    521467A-01: Digital image processing, exam, 0 op
    521467A-02: Digital image processing, Exercise work, 0 op
521484A: Statistical Signal Processing, 5 op
521495A: Artificial Intelligence, 5 op
812346A: Object Oriented Analysis and Design, 6 op

Bachelor's thesis and the studies included (vähintään 10 op)

555200A: Bachelor's Thesis / Industrial Engineering and Management, 8 op
555211A: Maturity Test / Industrial Engineering and Management, 0 op
900061A: Scientific Communication for Production Engineering and Management, 2 op

Optional Studies (enintään 10 op)

Optional Studies.

Choose the courses to get total of 180 ECTS to your degree.

A440171: Optional Studies, Bachelor of Science (Industrial Engineering and Management), 0 - 20 op

Tutkintorakenteisiin kuulumattomat opintokokonaisuudet ja -jaksot

555360S: Administration, Organization and Education in Working Life, 5 op
555311S: Advanced Internship, 3 op
721704P: Business Logistics, 5 op
555368S: Contemporary Ergonomics, 3 op
470460A: Controls and Systems Engineering Fundamentals, 5 op
555363S: Creativity at Work and in Product Development, 5 op
555325S: Human Resources Management, 3 op
521319A: Introduction to Telecommunication Engineering, 2,5 op
521481P: Introduction to the Use of Workstation, 1 op
724110P: Introductory Economics, 5 op
724105P: Management Accounting, 5 op
555342S: Operations Research, 5 op
721409P: Principles of Marketing, 5 op
724106P: Principles of Marketing, 5 op
555286A: Process and quality management, 5 op
555343S: Product Data and product life cycle management, 5 op
521024A: Programmable Electronics, 5 op

555283A: Project Communication, 3 op
555380S: Quality Management, 5 op
555348S: Research project in product development management, 5 op
555321S: Risk Management, 3 op
555347S: Seminar in product development management, 5 op
555320S: Strategic Management, 5 op
555340S: Technology Management, 4 op
813352A: Usability Testing, 5 op

Opintojaksojen kuvaukset

Tutkintorakenteisiin kuuluvien opintokohteiden kuvaukset

A440221: Module of the Option, obligatory, 30 op

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

Ei opintojaksokuvauksia.

A440222: Usability Design and Management of Well-Being at Work, Advanced Module, 30 op

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

Ei opintojaksokuvauksia.

Electives

555361A: Machine Safety and Usability, 3,5 op

Opiskelumuoto: Advanced Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Seppo Väyrynen
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

ECTS Credits:
3,5 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 able to choose the design and management methods that enable the organization to remove risks especially on machines and products, and secondly to increase the usability of machines and products and user-friendliness of the work stations. He is able to apply the course's contribution to the company fulfilling the EU´s obligations under the newest regulation. The student knows the responsibilities for risk control and opportunities of high quality well-being and usability in design and management.

Contents:

The course makes students familiar with the design of machinery, product or plant, which is characterized by proper usability and safety features. The course also develops the abilities to analyse, enhance and maintain a high level of safety and productivity by means of modern management and leadership. Additionally, the new EU and global standardization and harmonization of machine safety. Safety analysis. Work accidents related to machines. Ergonomics and usability in design which, in addition to safety, promote user experience as a part of usability of products and well-being at work.

Mode of delivery:

Face-to-face teaching, blended teaching.

Learning activities and teaching methods:

Lectures 20 h. The rest of learning comprises teaching without guidance either privately or in a group. The exercises are mainly completed as group work.

Target group:

Mainly for students from the Department of Mechanical Engineering.

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Väyrynen, Nevala & Päivinen (2004) Ergonomia ja käytettävyys suunnittelussa, Teknologiateollisuus ry. 336 s. ISBN: 951-817-848-8 (soveltuvin osin); MetSta-verkkojulkaisu: http://www.metsta.fi/koneturvallisuus/ ; Väyrynen, S. (2011) Johdanto koneturvallisuus ja käytettävyys –kurssiin. Pdf-moniste; Käyttöasetuksen soveltamissuosituksia, Työsuojelujulkaisuja 91. Työsuojeluhallinto 2009; Koneturvallisuus. Koneiden tekniset vaatimukset ja vaatimustenmukaisuus. Työsuojeluoppaita ja -ohjeita 16. Työsuojeluhallinto 2008; Kone-, tuotanto- ja materiaalitekniikka. Koneiden turvallisuus. SFS-käsikirja 403. Suomen Standardisoimisliitto 2009; www.sfsedu.fi ja www.metsta.fi (kts. tietoja koneturvallisuus ja ergonomiastandardeista); http://www.finlex.fi (kts. laki 738/2002, asetus 400/2008, asetus 403/2008); TSO-5: Pienyrityksen työympäristö tuloksen tekijänä. Aluehallintovirasto 2012; Dul, J & Weerdmeester, B (2008): Ergonomics for beginners: a quick reference guide. 3rd ed. CRC Press; www.vtt.fi/proj /riskianalyysit/.

Assessment methods and criteria:

Exam and exercises from which only main ones are compulsory.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

1-5

Person responsible:

proProfessor Seppo Väyrynen and Tatu Prykäri

Working life cooperation:

No.

Other information:

-

555362S: Safety in Process Industry, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Seppo Väyrynen

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5,0 ECTS credits.

Language of instruction:

Finnish.

Timing:

The course unit is held in the autumn and spring semester, during Periods 2-4.

Learning outcomes:

After the course the student is capable of identifying various hazards at the process plant. He is able to perform various safety analyses. He is also able to explain the impacts of technology, organization and person for risks and accidents. In addition, the student is able to make conception of the risk management as a part of safety management.

Contents:

The course makes the student familiar with the design of process plant, which is characterised by proper ergonomic and safety features. The course also develops the abilities to analyse, enhance and maintain a high level of safety and productivity by means of modern management and leadership. Additionally, safety management, safety culture, standards and legislation, methods of safety analysis, industrial maintenance.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures and exercises 85 h. Exercises are completed as group work.

Target group:

-

Prerequisites and co-requisites:

-

Recommended optional programme components:

555260P Introduction to occupational safety and well-being at work.

Recommended or required reading:

Laitinen, H, Vuorinen, M & Simola, A: Työturvallisuuden ja -terveyden johtaminen. Tietosanoma, 2009. 494 s., ISBN: 978-951-885-275-2. Kletz T. & Amyotte P. (2010) Process Plants: A Handbook for Inherently Safer Design, Second Edition. CRC Press (suitable chapters only). Documentation about the issues from lectures and exercises, among others the material from TUKES, STM and TVL. www.vtt.fi/proj /riskianalyysit/ and http://virtual.vtt.fi/virtual/proj3/alarp.Other literature reported at the beginning of the course.

Assessment methods and criteria:

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

Grading:

1-5

Person responsible:

Henri Jounila and Professor Seppo Väyrynen.

Working life cooperation:

No.

Other information:

-

555364S: Ergonomics, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Seppo Väyrynen

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish.

Timing:

The course unit is held in the autumn semester, during Periods 1-3.

Learning outcomes:

After the completion of the course students are able to design artefacts in human-centred way, further they can analyze and evaluate human factors and the interaction of humans and production system. They can choose and apply the methods which will enhance the users' / employees' productivity, safety, health, and well-being. They can innovate, develop and design products and production system according to physical, cognitive and organizational ergonomics. They know the basics of international standards of this field.

Contents:

The fundamental principles of ergonomics and its applications. The anthropometrics, biomechanics, work physiology, cognitive psychology, organisational and participative approaches, gerontechnology, design for all, inclusive design. The principles of human-centred design and measurements, CAD, simulation, user study, usability study, industrial cases. Usability of products and usability within work system are the main goal of ergonomic design.

Mode of delivery:

Face-to-face teaching, blended teaching.

Learning activities and teaching methods:

Lectures 26 h. The rest of learning comprises teaching without guidance either privately or in a group. The exercises, including a seminar, are mainly completed as group work.

Target group:

-

Prerequisites and co-requisites:

-

Recommended optional programme components:

555260P Introduction to occupational safety and well-being at work; 555262A Usability and Safety in Product Development.

Recommended or required reading:

Väyrynen, S., Nevala, N. & Päivinen, M. (2004) Ergonomia ja käytettävyys suunnittelussa, Teknologiateollisuus ry. 336 S. ISBN: 978-0-8493-7306-0 (sid.), 0-8493-7306-9-(sid.); SFS-ergonomiastandardit (EN-ISO, www.sfs.fi); www.ttl.fi/fi/ergonomia; SFS-Käsikirja 48-1: Esteettömyys. Osa 1: Johdanto ja periaatteet tuotteiden, palveluiden ja ympäristöjen suunnitteluun. 2010; Bridger, R. (2009). Introduction to ergonomics. 3rd edition. CRC Press.

Assessment methods and criteria:

Exam and exercises from which only the main ones are compulsory.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

1-5

Person responsible:

Professor Seppo Väyrynen and Tatu Prykäri.

Working life cooperation:

-

Other information:

-

555366S: Chemical and Physical Hazards in Industrial Environments, 3 op

Opiskelumuoto: Advanced Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Seppo Väyrynen
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

ECTS Credits:

3,0 ECTS credits.

Language of instruction:

Finnish.

Timing:

The course unit is held in the autumn semester, during Periods 1-3.

Learning outcomes:

After the course the student is capable of identifying chemical, physical and biological hazards of working environment. He has the basic skills to plan measurements as well as document and analyze results of measurements. In addition, the student is able to use the most common sound level meters and photometer.

Contents:

Theoretical background of the chemical and physical hazards in industrial environments. The main emphasis is on learning measurement, monitoring and control principles and practices. Noise and lighting. Occupational diseases. Safety management.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures and exercises 50 h.

Target group:

-

Prerequisites and co-requisites:

-

Recommended optional programme components:

555260P Introduction to occupational safety and well-being at work.

Recommended or required reading:

Työhygieeniset mittaukset, Työterveyslaitos 2007, ISBN: 978-951-802-754-9 (nid.); Starck, J. ym.: Työhygienia, Työterveyslaitos 2008, ISBN: 978-951-802-604-7 (sid.). Other literature reported at the beginning of the course.

Assessment methods and criteria:

Exams, exercise and seminar.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

1-5

Person responsible:

Henri Jounila and Professor Seppo Väyrynen

Working life cooperation:

No

Other information:

-

555367S: Exercises in Work Science, 6 op

Opiskelumuoto: Advanced Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Seppo Väyrynen

Opintokohteen kielet: Finnish

Leikkaavuudet:

   555379S   Research Project in Industrial Engineering and Management   5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

6 ECTS credits.

Language of instruction:

Finnish.

Timing:

Periods 2-5

Learning outcomes:

After the course the student is able to apply human-centred know-how and methods to the product, working environment and system development or innovation. He knows how to utilize the principles of theoretical knowledge in design and management situations. Students are able to respond to contemporary work system or product development challenges. The students can also take advantage of research-based approach to solve a real problem in a company, research organization, or in a R & D project.

Contents:

The various previous courses on safety, ergonomics, human factors, industrial hygiene, usability, psychology, creativity and organizational development will give the knowledge and skills which will be instructed to apply to real industrial problems.

The participants are familiarized with systematic methods typical to projects. Well-known textbooks and research reports are utilized. Computer-aided systems, e.g. for data analysis, are presented.

Mode of delivery:

Partly face-to-face teaching, supported by blended teaching. Though, predominantly independent work.

Learning activities and teaching methods:

Lectures or corresponding instruction 6 h. The rest of course comprises learning research-style independent work supported by guidance in seminars or in a small group. The report of the exercise will be communicated in seminar.

Target group:

Advanced students being well familiar with work sciences, mainly from departments of industrial engineering and management or process engineering. Doctoral students can participate in the course, too.

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Presented at the beginning of the course.

Assessment methods and criteria:

Short part with lectures, instructed exercise project, including presentation of literature, methods, and results both in a seminar and in a form of written study report.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

1-5

Person responsible:

Professor Seppo Väyrynen.

Working life cooperation:

No

Other information:

-

721614A: Labour Law, 7 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Oulu Business School

Arvostelu: 1 - 5, pass, fail

Opettajat: Pulkkinen Markku

Opintokohteen kielet: Finnish

Leikkaavuudet:

   ay724612P   Labour law (OPEN UNI)   5.0 op

   ay721614A   Labour Law (OPEN UNI)   7.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

7 ects.

Language of instruction:

Finnish.

Timing:

Period C.

Learning outcomes:

After completing the course, student is familiar with Finnish labour law. The student knows the principles of industrial safety legislation, protection of privacy, Working Hours Act and Annual Holidays Act. The student will have knowledge of the law relating industrial relations and labour law.

Contents:

The course is intended to introduce students to basic legal structures, concepts in individual and collective labour law. The course is also intended to give a practical knowledge of the law relating to procedure in solving disputes of labour relations and basic knowledge in international and EU labour legislation.

Mode of delivery:

-

Learning activities and teaching methods:

30 hours of lectures (including exercises) and independent studying of the textbooks.

Target group:

-

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Kari-Pekka Tiitinen, Tarja Kröger: Työsopimusoikeus, Talentum Media Oy (2008).

Check availability from here.

Assessment methods and criteria:

Lectures and literature examination.

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

Grading:

1-5.

Person responsible:

Senior lecturer Markku Pulkkinen.

Working life cooperation:

-

Other information:

The number of students is limited.

A440223: Module of the Option/ Usability Design and Management of Well-Being at Work, Optional, 3 - 13 op

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

Ei opintojaksokuvauksia.

A440224: Module of the Option/Quality and Project Management, Advanced Module, 30 - 40 op

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

Ei opintojaksokuvauksia.

Electives

555382S: Project Business, 5 op

Opiskelumuoto: Advanced Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Jaakko Kujala
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish

Timing:

Periods 1-3.

Learning outcomes:

Objective: The course provides the student with the basic skills to manage a company practicing project business.

Learning outcomes: Upon completion the student can explain the management areas of project business and their essential contents. The student can compare the specific features of project business in different working environments and analyse their effect on the business model of the company. The student can evaluate the significance of a single projects and its management in reaching business goals.

Contents:

The specific features of project business, business models of a project company, sales and marketing of projects, project portfolio management, management of project networks.

Mode of delivery:

Face-to-face learning.

Learning activities and teaching methods:

Lectures and related exercises, group exercise. A learning diary, report of the group study and a presentation of the group study are required to pass the course.

Target group:

Undergraduate students of IEM.

Prerequisites and co-requisites:

555280P Basic course in project management and 555282A Project management or equivalent knowledge.

Recommended optional programme components:

-

Recommended or required reading:

Lecture material and course readings, Artto, Martinsuo & Kujala 2006. Projektiliiketoiminta. WSOY, ISBN: 951-0-31482-X (nid.), available at http://pbgroup.aalto.fi/en/the_book_and_the_glossary/

Assessment methods and criteria:

Learning diary, team work report and its presentation in the closing seminar.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

1-5

Person responsible:

Professor Jaakko Kujala

Working life cooperation:

No

Other information:

-

555381S: Project Leadership, 5 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Advanced Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Jokinen, Tauno Jaakko
Opintokohteen kielet: Finnish
Leikkaavuudet:

555391S   Advanced Course in Project Management   5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish

Timing:

Periods 1-3.

Learning outcomes:

Objective: To develop understanding of theoretical leadership frameworks and abilities to develop personal leadership skills.
Learning outcomes: Upon completion the student should be able to describe and apply essential theories of leadership.

Contents:

Essential theoretical leadership frameworks and their historical perspective. Psychodynamic and Morenoan approaches to developing personal leadership skills.

Mode of delivery:

Face-to-face learning.

Learning activities and teaching methods:

Essay, intensive lecture day and learning report

Target group:

Undergraduate students of IEM.

Prerequisites and co-requisites:

-

Recommended optional programme components:

555282A Project Management or equivalent knowledge recommended

Recommended or required reading:

Northouse PG (2001) Leadership: Theory and Practice; Second Edition. Sage Publications, Thousand Oaks. ISBN: 0-7619-1926-0 (nid.), 0-7619-1925-2 (sid.)

Assessment methods and criteria:

The assessment is based on the essay and the learning report.
Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5

Person responsible:

Mirja Väänänen

Working life cooperation:

No.

Other information:

-

555322S: Production Management, 3 op

Opiskelumuoto: Advanced Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Haapasalo, Harri Jouni Olavi
Opintokohteen kielet: English
Leikkaavuudet:

555333S   Production Management   5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

3 ECTS credits.

Language of instruction:

English.

Timing:

Periods 4-6.

Learning outcomes:

After finishing this course, the student will be able to analyze production processes and to define the cornerstones of managing different production modes. In addition the student will know how to analyze the bottlenecks in different production processes. Understanding the content of lean production. By combining this and previous courses, the student will be able to define the most important development areas in production processes.

Contents:

Analysing and developing manufacturing environment. Lean production. Change management. Management and operation information methods.

Mode of delivery:

Face-to-face teaching and group homework.

Learning activities and teaching methods:

Lectures, group work, seminar.

Target group:

Industrial engineering and management students.

Prerequisites and co-requisites:

555223A Introduction to production control & 555224A Methods of production management and logistics.

Recommended optional programme components:

-

Recommended or required reading:

Will be defined at the beginning of the course.

Assessment methods and criteria:

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

Grading:

1-5

Person responsible:

Professor Harri Haapasalo.

Working life cooperation:

No

Other information:

-

555323S: Sourcing Management, 3 op

Opiskelumuoto: Advanced Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Kess, Pekka Antero
Opintokohteen kielet: Finnish
Leikkaavuudet:

555330S   Sourcing Management   5.0 op

ECTS Credits:

3 ECTS credits.

Language of instruction:

Finnish.

Timing:

Periods 1-3.

Learning outcomes:

The course familiarizes a student with the overall concept of sourcing management. After completing the course student knows the key concepts of sourcing and purchase management and can explain these. The student can describe the structures of sourcing and purchasing organizations and can explain the meaning of management in the performance of operations. The student can analyse the purchasing activities in a company and can produce improvement proposals based on the analysis. After the course the student can take part in the purchasing operations development in the role of an expert.

Contents:

Purchasing operations in a manufacturing company, the principles of the sourcing and purchasing strategy and practices, suppliers and products, IT systems for sourcing and purchase.

Mode of delivery:

Multiple methods.

Learning activities and teaching methods:

Lectures and group work.

Target group:

Industrial engineering and Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

555324S Advanced supply chain management.

Recommended or required reading:

Lecture notes. Other material will be informed during the lectures.

Assessment methods and criteria:

Group work report / exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

1-5

Person responsible:

Professor Pekka Kess.

Working life cooperation:

No

Other information:

-

555324S: Advanced Supply Chain Management, 3 op

Opiskelumuoto: Advanced Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Kess, Pekka Antero
Opintokohteen kielet: Finnish
Leikkaavuudet:

555331S   Supply Network Management   5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

3 ECTS credits.

Language of instruction:

Finnish.

Timing:

Periods 4-6.

Learning outcomes:

The aim of the course is to familiarize a student with the latest theories and practices in supply chain management. After completing the course the student can explain the principles of supply chain management. The student can describe the supply chain structures and communicate the importance of effective supply chain. The student can analyze supply chain, propose improvements based on the analysis, and work in supply chain development related tasks.

Contents:

Supply chain management, analysis, and development.

Mode of delivery:

face-to-face teaching and group homework

Learning activities and teaching methods:

Lectures, group work, final report and seminar

Target group:

Industrial engineering and management students.

Prerequisites and co-requisites:

555320S Strategic Management, B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Lecture materials, Sakki, J. (2009) Tilaus-toimitusketjun hallinta, Vantaa, Jouni Sakki Oy.

Assessment methods and criteria:

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

Grading:

1-5

Person responsible:

Professor Pekka Kess.

Working life cooperation:

No

Other information:

-

555385S: Advanced Course in Quality Management, 5 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Advanced Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Jaakko Kujala
Opintokohteen kielet: Finnish
Leikkaavuudet:

   555378S   Seminar in industrial engineering and management   5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5-10 ECTS credits.

Language of instruction:

Finnish/English

Timing:

periods 1-6.

Learning outcomes:

Objective: To learn to apply different methods in decision making related to a company's strategy or operations.
Learning outcomes: Upon completion the student can systematically analyse the challenges related to a company's business and develop alternative solutions to them.

Contents:

Changing content on topical subjects.

Mode of delivery:

Face-to-face learning.

Learning activities and teaching methods:

Depending on the topic.

Target group:

Undergraduate students of IEM

Prerequisites and co-requisites:

Bachelor in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Depending on the topic.

Assessment methods and criteria:

Will be defined at the beginning of the course.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

1-5

Person responsible:

Professor Jaakko Kujala, Osmo Kauppila

Working life cooperation:

No

Other information:

-

555386S: Advanced Course in Project Management, 5 op

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

   555378S   Seminar in industrial engineering and management   5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish/English.

Timing:

Periods 1-6.

Learning outcomes:

Objective: To familiarise with research focus areas of project management and project business.
Learning outcomes: Upon completion the student can present research areas related to project management and project business. He can evaluate research of the areas and discuss it critically.

Contents:

Research themes of project management and project business.

Mode of delivery:

Face-to-face learning.

Learning activities and teaching methods:

Student must attend six seminaries of his choice and act as a chair in one of them. The course goes on continuously and the student can choose the seminars he attends. The student must write a literary report of one of the research themes discussed.

Target group:

Undergraduate students of IEM

Prerequisites and co-requisites:

Bachelor in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Seminary readings.

Assessment methods and criteria:

Will be defined at the beginning of the course
Read more about assessment criteria at the University of Oulu webpage.

Grading:

1-5

Person responsible:

Professor Jaakko Kujala

Working life cooperation:

-

Other information:

-

555387S: Project Work in Quality Management, 5 op

Opiskelumuoto: Advanced Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Haapasalo, Harri Jouni Olavi, Osmo Kauppila
Opintokohteen kielet: Finnish
Leikkaavuudet:

   555379S   Research Project in Industrial Engineering and Management   5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish/English.

Timing:

Periods 1-6.

Learning outcomes:

Objective: Applying the methods of quality management in a company's activities and development. On the course the student can combine and apply earlier gained knowledge in the form of a wide study. The student familiarises with research work and reporting of the results.
Learning outcomes: Upon completion the student can analyse and develop the activities of a company using the methods of quality management.

Contents:

Subject and type of work changes by the case. Mostly the subjects come from the industry and relate to actual problems.

Mode of delivery:

Blended learning.

Learning activities and teaching methods:

The methods are agreed with the instructor of the work. Research plan, familiarizing with related literature, solving the problem and a literary report are required to pass. The work can be done individually or in a group.

Target group:

Undergraduate students of IEM

Prerequisites and co-requisites:

Bachelor in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Changes by the case.

Assessment methods and criteria:

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

Grading:

1-5

Person responsible:

Osmo Kauppila

Working life cooperation:

-

Other information:

-

555388S: Project Work in Project Management, 5 op

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

  555379S   Research Project in Industrial Engineering and Management   5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish/English.

Timing:

Periods 1-6.

Learning outcomes:

Objective: Applying the methods of project and project business management in a company's activities and development. On the course the student can combine and apply earlier gained knowledge in the form of a wide study. The student familiarises with research work and reporting of the results.
Learning outcomes: Upon completion the student can analyse and develop the activities of a project company.

Contents:

Subject and type of work changes by the case. Mostly the subjects come from the industry and relate to actual problems.

Mode of delivery:

Blended learning.

Learning activities and teaching methods:

The methods are agreed with the instructor of the work. Research plan, familiarizing with related literature, solving the problem and a literary report are required to pass. The work can be done individually or in a group.

Target group:

Undergraduate students of IEM

Prerequisites and co-requisites:

Bachelor in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Changes by the case.

Assessment methods and criteria:

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

Grading:

1-5

Person responsible:

Professor Jaakko Kujala.

Working life cooperation:

-

Other information:

-

555345S: Advanced Course in Product Development, 6 op

Opiskelumuoto: Advanced Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Haapasalo, Harri Jouni Olavi
Opintokohteen kielet: English
Leikkaavuudet:

555351S   Advanced Course in Product Development   5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

6 ECTS credits.

Language of instruction:

English

Timing:

Periods 1-3.

Learning outcomes:

The student understands the objectives of requirements engineering in order to develop sustainable products. The course familiarizes the student to requirements engineering process and its key activities. After finishing the course, the student will able to analyze requirements engineering in product development processes. The student knows Design for Excellence (DfX) practice. The student can recognize different stakeholder specific requirements and their diversity.

Contents:

The concepts of requirements management, requirements engineer process, requirement prioritization and valuation, Design for Excellence (DfX), different stakeholders and their requirements for product development.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures and group work.

Target group:

Industrial engineering and management students

Prerequisites and co-requisites:

555240A Basic course in product development, 555340S Technology management.

Recommended optional programme components:

-

Recommended or required reading:

Will be defined at the beginning of the course.

Assessment methods and criteria:

Group work, exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

1-5

Person responsible:

Professor Harri Haapasalo.

Working life cooperation:

No

Other information:

-

A440226: Module of the Option/ Production Management, Advanced Module, 30 - 40 op

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

Ei opintojaksokuvauksia.

Choose 555326S Research project in production management or 555327S Seminar in production management.

555326S: Research Project in Production Management, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

555379S   Research Project in Industrial Engineering and Management   5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ECTS. The course is also possible to carry out more extensive than 5 ECTS, but this must be agreed with the course supervisor.

Language of instruction:

Finnish, can be also made in English.

Timing:

Periods 1-6.

Learning outcomes:

Applying the methods of production management in a company's activities and development. On the course, the student can combine and apply earlier gained knowledge in the form of a wide study. After finishing the course, the student will able to systematically analyze and develop operations of a company by utilizing methods of production management. The student can also present research areas related to production management and can evaluate research of the area and discuss it critically. The student familiarizes with research work and reporting of the results.

Contents:

Changing content on topical subjects.

Mode of delivery:

The methods are agreed with the instructor of the work.

Learning activities and teaching methods:

The methods are agreed with the instructor of the work. Research plan, familiarizing with related literature, solving the problem and a literary report are required to pass. The work can be done individually or in a group.

Target group:

Industrial engineering and Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Depending on the topic.

Assessment methods and criteria:

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

Grading:

1-5 or approved/not approved.

Person responsible:

Professor Pekka Kess.

Working life cooperation:

No.

Other information:

-

555327S: Seminar in Production Management : Lab to Market, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Kess, Pekka Antero

Opintokohteen kielet: Finnish

Leikkaavuudet:

   555375S   Lab to Market   5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ECTS credits

Language of instruction:

Finnish, a student can write the report also in English.

Timing:

Periods 1-3.

Learning outcomes:

The aim of the course is to learn to apply different production management methods in decision making related to a company's strategy or operations. After finishing the course, the student will able to analyze and develop operations of a company by utilizing methods of production management.

Contents:

Changing content on topical subjects.

Mode of delivery:

Depending on the topic.

Learning activities and teaching methods:

The methods are agreed with the instructor of the work. Research plan, familiarizing with related literature, solving the problem and a literary report are required to pass. The work can be done individually or in a group.

Target group:

Industrial engineering and Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Depending on the topic.

Assessment methods and criteria:

Will be defined at the beginning of the course.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

1-5 or approved/not approved

Person responsible:

Professor Pekka Kess.

Working life cooperation:

No.

Other information:

-

Electives

555322S: Production Management, 3 op

Opiskelumuoto: Advanced Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Haapasalo, Harri Jouni Olavi
Opintokohteen kielet: English
Leikkaavuudet:

   555333S   Production Management   5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

3 ECTS credits.

Language of instruction:

English.

Timing:

Periods 4-6.

Learning outcomes:

After finishing this course, the student will be able to analyze production processes and to define the cornerstones of managing different production modes. In addition the student will know how to analyze the bottlenecks in different production processes. Understanding the content of lean production. By combining this and previous courses, the student will be able to define the most important development areas in production processes.

Contents:

Analysing and developing manufacturing environment. Lean production. Change management. Management and operation information methods.

Mode of delivery:

Face-to-face teaching and group homework.

Learning activities and teaching methods:

Lectures, group work, seminar.

Target group:

Industrial engineering and management students.

Prerequisites and co-requisites:

555223A Introduction to production control & 555224A Methods of production management and logistics.

Recommended optional programme components:

-

Recommended or required reading:

Will be defined at the beginning of the course.

Assessment methods and criteria:

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

Grading:

1-5

Person responsible:

Professor Harri Haapasalo.

Working life cooperation:

No

Other information:

-

555323S: Sourcing Management, 3 op

Opiskelumuoto: Advanced Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Kess, Pekka Antero

Opintokohteen kielet: Finnish

Leikkaavuudet:

   555330S   Sourcing Management   5.0 op

ECTS Credits:

3 ECTS credits.

Language of instruction:

Finnish.

Timing:

Periods 1-3.

Learning outcomes:

The course familiarizes a student with the overall concept of sourcing management. After completing the course student knows the key concepts of sourcing and purchase management and can explain these. The student can describe the structures of sourcing and purchasing organizations and can explain the meaning of management in the performance of operations. The student can analyse the purchasing activities in a company and can produce improvement proposals based on the analysis. After the course the student can take part in the purchasing operations development in the role of an expert.

Contents:

Purchasing operations in a manufacturing company, the principles of the sourcing and purchasing strategy and practices, suppliers and products, IT systems for sourcing and purchase.

Mode of delivery:

Multiple methods.

Learning activities and teaching methods:

Lectures and group work.

Target group:

Industrial engineering and Management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

555324S Advanced supply chain management.

Recommended or required reading:

Lecture notes. Other material will be informed during the lectures.

Assessment methods and criteria:

Group work report / exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

1-5

Person responsible:

Professor Pekka Kess.

Working life cooperation:

No

Other information:

-

555324S: Advanced Supply Chain Management, 3 op

Opiskelumuoto: Advanced Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Kess, Pekka Antero

Opintokohteen kielet: Finnish

Leikkaavuudet:

   555331S   Supply Network Management   5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

3 ECTS credits.

Language of instruction:

Finnish.

Timing:

Periods 4-6.

Learning outcomes:

The aim of the course is to familiarize a student with the latest theories and practices in supply chain management. After completing the course the student can explain the principles of supply chain management. The student can describe the supply chain structures and communicate the importance of effective supply chain. The student can analyze supply chain, propose improvements based on the analysis, and work in supply chain development related tasks.

Contents:

Supply chain management, analysis, and development.

Mode of delivery:

face-to-face teaching and group homework

Learning activities and teaching methods:

Lectures, group work, final report and seminar

Target group:

Industrial engineering and management students.

Prerequisites and co-requisites:

555320S Strategic Management, B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Lecture materials, Sakki, J. (2009) Tilaus-toimitusketjun hallinta, Vantaa, Jouni Sakki Oy.

Assessment methods and criteria:

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

Grading:

1-5

Person responsible:

Professor Pekka Kess.

Working life cooperation:

No

Other information:

-

555344S: Management Information Systems, 5 op

Voimassaolo: - 31.07.2015

Opiskelumuoto: Advanced Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Leikkaavuudet:

   555314S   Management Information Systems   5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

4 ECTS credits.

Language of instruction:

English

Timing:

Periods 4-6.

Learning outcomes:

The aim of the course is to provide readiness for enterprise information system designing, purchasing, and development tasks. The aim is to familiarize a student with the significance of information and its management when controlling processes. After completing the course student can explain the key concepts of management information systems (MIS). The student can define the information needs of management processes and how information systems can meet these needs. The student can describe the key features of the following types of systems: DSS, GDSS, EIS, BI, and ERP. The student can analyse the state of the management in an organisation, and can suggest a suitable type of information system to support the management. After the course the student can take part in the organisational development from MIS viewpoints.

Contents:

Management information systems (MIS), information systems in decision making and leadership, Decision Support Systems (DSS), Group Support Systems (GSS), Executive Information Systems (EIS), the effects of information technology in operations, examining the effects of information and communication technology on productivity, financial growth, and the formation of national competitiveness.

Mode of delivery:

multiple methods available. The principal way to conduct the course is participate face-to-face teaching (that is held mainly in Finnish). Course is also given in English based on distance learning and closing session where the group work is represented.

Learning activities and teaching methods:

Lectures and independent work, or group work and seminar.

Target group:

Industrial engineering and management students.

Prerequisites and co-requisites:

B.Sc. in Industrial Engineering and Management or equivalent.

Recommended optional programme components:

-

Recommended or required reading:

Lecture materials and given set of journal articles. Laudon, K.C. & Laudon, J.P. 2004. Management Information systems. Prentice Hall. ISBN: 0-13-120681-8.

Assessment methods and criteria:

Learning diary (recommended when participating to the lectures), or group work report and seminar representation (recommended for exchange students), or exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

1-5

Person responsible:

Professor Pekka Kess.

Working life cooperation:

No

Other information:

-

555341S: Productivity and Performance Management, 3 op

Opiskelumuoto: Advanced Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Haapasalo, Harri Jouni Olavi
Opintokohteen kielet: English

ECTS Credits:

3 ECTS credits.

Language of instruction:

English

Timing:

Periods 4-6.

Learning outcomes:

After finishing the course, the student will able to analyse the efficiency of activities in an organization, from both internal and external viewpoints. The internal analysis is based on Balanced Score Card or other equivalent performance measurement. External measurement of efficiency in based on analysing productivity development and the factors affecting it.

Contents:

The concepts of productivity and performance and the levels to their examination. Productivity and its significance to an enterprise's processes and profitability. Measuring productivity and performance. The metrics of productivity and operative steering tools. An enterprise's internal and external productivity. The analysis and the tools for analysis of productivity and the approaches for measuring productivity in industry.

Mode of delivery:

Face-to-face teaching and group work.

Learning activities and teaching methods:

Lectures, group work.

Target group:

Industrial engineering and management students.

Prerequisites and co-requisites:

555340S Technology management.

Recommended optional programme components:

-

Recommended or required reading:

Lecture materials. Sumanth, D.J. 1998. Total productivity management, A systematic and quantitative approach to compete in quality, price and time. CRC Press LLC. 407 p.

Assessment methods and criteria:

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

Grading:

1-5

Person responsible:

Professor Harri Haapasalo.

Working life cooperation:

No

Other information:

-

555381S: Project Leadership, 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Advanced Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Jokinen, Tauno Jaakko

Opintokohteen kielet: Finnish

Leikkaavuudet:

   555391S   Advanced Course in Project Management   5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish

Timing:

Periods 1-3.

Learning outcomes:

Objective: To develop understanding of theoretical leadership frameworks and abilities to develop personal leadership skills.
Learning outcomes: Upon completion the student should be able to describe and apply essential theories of leadership.

Contents:

Essential theoretical leadership frameworks and their historical perspective. Psychodynamic and Morenoan approaches to developing personal leadership skills.

Mode of delivery:

Face-to-face learning.

Learning activities and teaching methods:

Essay, intensive lecture day and learning report

Target group:

Undergraduate students of IEM.

Prerequisites and co-requisites:

-

Recommended optional programme components:

555282A Project Management or equivalent knowledge recommended

Recommended or required reading:

Northouse PG (2001) Leadership: Theory and Practice; Second Edition. Sage Publications, Thousand Oaks. ISBN: 0-7619-1926-0 (nid.), 0-7619-1925-2 (sid.)

Assessment methods and criteria:

The assessment is based on the essay and the learning report.
Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5

Person responsible:

Mirja Väänänen

Working life cooperation:

No.

Other information:

-

555346S: Product management, 5 op

Opiskelumuoto: Advanced Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Arto Tolonen
Opintokohteen kielet: English
Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ECTS credits.

Language of instruction:

English

Timing:

Periods 4-6

Learning outcomes:

The course familiarizes students with the broad concepts of product management. After finishing the course, the student understands central principles and contents of product management. Student knows the basics of product portfolio management and understands the ways to analyse products business case. A student learns to see product management as an organizational lifecycle function that focus managing all products and related actions in all product lifecycle phases. The student can apply the learned things and methods in different industries in order to develop systematic product management.

Contents:

Basic issues in product management, sub-processes that are included in product management, methods and tools for product management, product portfolio management, product business case.

Mode of delivery:

Face-to-face learning.

Learning activities and teaching methods:

Will be defined at the beginning of the course.

Target group:

Industrial engineering and management students

Prerequisites and co-requisites:

555240A Basic course in product development, 555340S Technology management, 555320S Strategic management.

Recommended optional programme components:

-

Recommended or required reading:

Will be defined at the beginning of the course.

Assessment methods and criteria:

Will be defined at the beginning of the course.
Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5

Person responsible:

Professor Harri Haapasalo

Working life cooperation:

No

Other information:

-

A440225: Module of the Option/ Management of Product Development, Advanced Module, 30 - 40 op

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

Ei opintojaksokuvauksia.

A440255: Supplementary Module, Mechanical Engineering, 20 - 30 op

Voimassaolo: 01.08.2013 -
Opiskelumuoto: Supplementary Module
Laji: Study module
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

A440248: Supplementary Module, Structural Engineering and Construction Technology, 20 - 30 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Supplementary Module
Laji: Study module
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

A440249: Supplementary Module, Process Engineering, 20 - 30 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Supplementary Module
Laji: Study module
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

A440256: Supplementary Module, Environmental Engineering, 20 - 30 op

Voimassaolo: 01.08.2013 -
Opiskelumuoto: Supplementary Module
Laji: Study module
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

A440253: Supplementary Module, Electronics and Communications Engineering, 20 - 30 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Supplementary Module
Laji: Study module
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

A440254: Supplementary Module, Information, 20 - 30 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Supplementary Module
Laji: Study module
Vastuuyksikkö: Department of Computer Science and Engineering
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

A440273: Special Module, 10 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Special Module
Laji: Study module
Vastuuyksikkö: Department of Computer Science and Engineering
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

470099S: Master's Thesis in Industrial Engineering and Management, 30 op

Voimassaolo: - 19.09.2018
Opiskelumuoto: Advanced Studies
Laji: Diploma thesis
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Leikkaavuudet:

555300S   Master's Thesis   30.0 op

ECTS Credits:
30 ECTS credits.
Language of instruction:
Finnish, thesis can be done in English.
Timing:
Periods 1-6.
Learning outcomes:
The objective is to deepen students' competence in selected area(s) of IEM and in research work. After the course, the students will be able to solve problems of organizations by himself/herself. The student is able to prepare a study plan, including defining research problem and research questions, and follow the plan. Student is able to specify scientific viewpoint suitable for the problem, and based on it, define suitable process for studying the problem and criteria to analyse the process. The student is able to critically use different kind of references. The student is able to draw up a report based on given instructions.
Contents:
Defined by the student and the supervisor.
Mode of delivery:
Individually conducted thesis.
Learning activities and teaching methods:
Individually conducted thesis and a maturity test.
Target group:
Industrial engineering and Management students.
Prerequisites and co-requisites:
555210A Internship, 555311S Advanced internship, 555200A Bachelor's thesis.
Recommended optional programme components:
-
Recommended or required reading:
Kauranen, Ilkka; Mustakallio, Mikko; Palmgren, Virpi. Tutkimusraportin kirjoittamisen opas opinnäytetyön tekijöille - 2. korj. p. 2007 Teknillinen korkeakoulu; Kirjasto Espoo, 2006. - 109 s.   Kustantaja: Teknillinen korkeakoulu ISBN 951-22-8359-X UDK: 001.818; Hirsjärvi, Sirkka, Remes, Pirkko & Sajavaara, Paula: Tutki ja kirjoita. Tammi 2003, Helsinki; Uusitalo, Hannu: Tiede, tutkimus ja tutkielma. Johdatus tutkielman maailmaan. WSOY 1999, Helsinki.
Assessment methods and criteria:
Master's Thesis.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1-5
Person responsible:
Professors at the department
Working life cooperation:
Yes.
Other information:
-

555312S: Maturity Test / Industrial Engineering and Management, 0 op

Opiskelumuoto: Advanced Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

555302S   Maturity Test / Master of Science in Industrial Engineering and Management   0.0 op

Ei opintojaksokuvauksia.

A440120: Basic and Intermediate Studies, Industrial Engineering and Management, 119,5 - 120 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Basic and Intermediate Studies

Laji: Study module

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Compulsory to all

555212P: Orientation Course for New Students, 1 op

Voimassaolo: 01.08.2013 -

Opiskelumuoto: Basic Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Eija Forsberg

Opintokohteen kielet: Finnish

ECTS Credits:

1 cr

Language of instruction:

Finnish

Timing:

Periods 1-6.

Learning outcomes:

After completing the course, a student is familiar with his / her new Oulu studying environment (e.g. classrooms, libraries and their services, City of Oulu in essence), University studying information systems (e.g. e-mail, OODI, Lukkari), University student organizations and their role in learning as well as in society, and the services offered to the students.

A student is familiar with the field of study and the course structure of the degree programme of his / her own. A student is able to draw up a timetable for his / her studying by using the information systems of University. A student is able to design his / her own studies, as well manage the use of time bearing in mind the curriculum. A student is able to create a study plan (eHOPS) of his /her own.

Contents:

How to start the studying? University of Oulu and administration of it, Faculty of Technology, Department of IEM, and City of Oulu. The services offered by society, student organizations and the University. Degree programmes and the studies on the faculty of technology. The profession and the working situation of MSc (Techn) in IEM. Study design and study techniques. The services of Uni library, Oula -database teaching. Study planning.

Mode of delivery:

Face-to-face learning, blended learning.

Learning activities and teaching methods:

Briefings organized by University, Faculty of Technology and Department of Industrial Engineering and Management. Tutorials and tutoring. Libraries presentations. Planning a study plan for Bachelor's Degree in Industrial Engineering and Management.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Opinto-opas 2013-2014. 2013. Oulun yliopisto. Teknillinen tiedekunta.

Assessment methods and criteria:

A student must attend a certain number of tutorials and plan his / her own study plan for BSc (Tech, eHOPS).
Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

Approved/not approved.

Person responsible:

Student Advisor.

Working life cooperation:

No.

Other information:

The course is registered completed after the eHOPS of a student has been accepted.

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:

-

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:

-

031011P: Calculus II, 6 op

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

031075P   Calculus II   5.0 op
ay031011P   Calculus II (OPEN UNI)   6.0 op

ECTS Credits:

6

Language of instruction:

Finnish

Timing:

Spring semester, periods 4-6.

Learning outcomes:

After completing the course the student is able to examine the convergence of series and power series of real terms and estimate the truncation error. Furthermore, the student can explain the use of power series e.g. in calculating limits and approximations for definite integrals and is able to solve problems related to differential and integral calculus of real and vector valued functions of several variables.

Contents:

Sequences, series and power series of real terms. Differential and integral calculus of real and vector valued functions of several variables.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 62 h / Group work 26 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; Grossmann, S.I.: Multivariable Calculus, Linear Algebra and Differential Equations.

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:

-

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/

761104P: Wave Motion, 3 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Physics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

761310A   Wave motion and optics   5.0 op

761310A-01   Wave motion and optics, lectures and exam   0.0 op

761310A-02   Wave motion and optics, lab. exercises   0.0 op

761114P-01   Wave motion and optics, lectures and exam   0.0 op

761114P-02   Wave motion and optics, lab. exercises   0.0 op

761114P   Wave motion and optics   5.0 op

ECTS Credits:

3 credits

Language of instruction:

Lectures and exercises in Finnish. Material in English.

Timing:

Spring

Learning outcomes:

The student can classify different types of wave motions and can name the characterizing quantities (wavelength, period, wave speed), can apply geometrical optics to simple mirror and lens systems, can explain the meaning of interference and diffraction and their applications, like using interference to determine wavelength of radiation.

Contents:

Basic course on wave motion, and geometric and wave optics.
Wave motion and propagation. Acoustics. Geometric optics: basic principles, mirrors and lenses. Electromagnetic waves. Wave optics: interference, diffraction, and polarization. Optical instruments. Photometry. Laser.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 32 h, exercises 10 h, self-study 38 h

Target group:

The students of the University of Oulu

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:

Text book: H.D. Young and R.A. Freedman: University physics, Addison-Wesley, 13th edition, 2008. Also earlier editions can be used.
Course material availability can be checked here.

Assessment methods and criteria:

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

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Sami Heinäsmäki

Working life cooperation:

No work placement period

Other information:

https://noppa.oulu.fi/noppa/kurssi/761104p/etusivu

721172P: Management Accounting, 5 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Oulu Business School

Arvostelu: 1 - 5, pass, fail

Opettajat: Janne Järvinen

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay721172P   Management Accounting (OPEN UNI)   5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ects.

Language of instruction:

English (course is lectured separately in Finnish and in English).

Timing:

Period C.

Learning outcomes:

After passing the course, the student knows the basic cost concepts and the elements of cost accounting systems. Students are also able to apply the basic cost information in the company's decision making and explain which costs, in which circumstances should be included in these calculations.

Contents:

Theoretical framework for understanding cost accounting, cost concepts, cost recording, different product costing methods, cost-volume-profit analysis, using cost accounting information in decision making.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

40 h lectures and exercises, independent reading of study materials.

Target group:

Major and minor students.

Prerequisites and co-requisites:

-

Recommended or required reading:

Drury, C.: Management and cost accounting. Thomson Business Press, 5th ed. 2000 or newer. Chapters 1-14 (in 6th edition pages 3-584); Supplementary material in Finnish: Vehmanen P. & Koskinen K.: Tehokas kustannushallinta. WSOY, Ekonomia -sarja 1997 Chapters 1-2, 4-7, 9.
Availability of course books.

Assessment methods and criteria:

Lectures and literature examination.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

1-5.

Person responsible:

Professor in Management Accounting.

Working life cooperation:

-

Other information:

Number of students is limited.

721210P: Economics for Business, 5 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Oulu Business School

Arvostelu: 1 - 5, pass, fail

Opettajat: Tatu Pellervo Hirvonen

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay721210P   Economics for Business (OPEN UNI)   5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ects, course is designed for students with a minor subject in Economics.

Language of instruction:

Finnish.

Timing:

Period A.

Learning outcomes:

After completing the course, the student can describe how firms, consumers and government interact in markets and how the economy as a whole operates. In addition, the student can apply the principles of economic way of thinking. These principles can be used to examine e.g. consumers' consumption decisions, firm's production decisions or the behavior of the aggregate market.

Contents:

Market mechanism: price formation, importance of prices in directing the economic resources, role of consumers, firms and public authority in market economy. The course covers all of the major principles of economics, but its focus is on applying these economic principles to the real world of business.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

30 hours of lectures and individual reading of the literature.

Target group:

Students with a minor subject in Economics.

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Begg, D. & Ward, D.: Economics for Business 3. ed., McGraw-Hill Education (2009) and other material given in class.

Check availability from here.

Assessment methods and criteria:

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

Grading:

1-5.

Person responsible:

Lecturer in Economics.

Working life cooperation:

-

Other information:

The number of students is limited.

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

Opiskelumuoto: Basic Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Seppo Väyrynen, Henri Jounila

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

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.

555262A: Usability and Safety in Product Development, 3 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Seppo Väyrynen

Opintokohteen kielet: Finnish

Leikkaavuudet:

555264P   Managing well-being and quality of working life   5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

3 ECTS credits.

Language of instruction:

Finnish.

Timing:

Periods 3-4

Learning outcomes:

After the course the student is able to analyze the usability of artefacts and design products that have good characteristics in usability. Students are able to compare the usability of artefacts using different methods.

Contents:

Requirement specification, user research, usability research, creation and evaluation of alternatives and the main course the standards are discussed. Examples and special topics are mostly related to information and communication technology or process technology areas. The course emphasizes these factors, management options and the emphasis on the specific product, product development and design, and the role of usability and security goals.

Mode of delivery:

Multiform learning.

Learning activities and teaching methods:

Lectures, exercises

Target group:

-

Prerequisites and co-requisites:

555240A Basic course in product development

Recommended optional programme components:

-

Recommended or required reading:

S. Väyrynen, N. Nevala & M. Päivinen (2004), Ergonomia ja käytettävyys suunnittelussa 336p., ISBN: 951-817-848-8; Kletz T. & Amyotte P. (2010), Process Plants: A Handbook for Inherently Safer Design, Second Edition. CRC Press; Other literature reported at the beginning of the course.

Assessment methods and criteria:

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

Grading:

Numerical 1-5/fail.

Person responsible:

Tatu Prykäri

Working life cooperation:

-

Other information:

-

555263A: Technology, Society and Work, 2 op

Voimassaolo: 01.08.2006 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Kisko, Kari Juhani

Opintokohteen kielet: Finnish

Leikkaavuudet:

   555265P   Occupational Safety and Health Management   5.0 op

ECTS Credits:

2 ECTS credits.

Language of instruction:

Finnish.

Timing:

Periods 1-3.

Learning outcomes:

Upon completion the student can explain the combined effect of technology, society and work on the lives of people. The students are able to make a literary report according to given guidelines and to evaluate an oral presentation.

Contents:

To familiarize with the meaning and role of technology and work in the development of society. To familiarize with the professional image of technology people as workers or an entrepreneurs and its development. In summary: the societal meaning and effects of technology looking from science, technology, society and internationality points of view.

Mode of delivery:

Contact teaching

Learning activities and teaching methods:

Lectures, group works and seminars.

Target group:

-

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Announced at the beginning of course.

Assessment methods and criteria:

Continuous assessment; lectures, group works and seminars.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical 1-5/fail.

Person responsible:

Lecturer Kari Kisko.

Working life cooperation:

No

Other information:

-

555240A: Basic Course in Product Development, 3 op

Voimassaolo: 01.06.2007 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Haapasalo, Harri Jouni Olavi

Opintokohteen kielet: Finnish

Leikkaavuudet:

   555242A   Product development   5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

3 ECTS credits **.**

Language of instruction:

Finnish.

Timing:

Periods 1-3.

Learning outcomes:

Objective: This study module introduces product development and innovations management in a company environment. Basic course in product development provides fundamental understanding over tools and frameworks that can be used for analysing and managing products, innovations, and technology development. The aim is to create a connection between product development and other company functions.

Learning outcomes: After this study module, a student is capable of explaining the role of product development as a company function. The student understands the difference between innovation activities and systematic product development, and knows the difference between different phases of product development process and its activities. Additionally, the student is able to define the meaning of other company functions to product development activities.

Contents:

Meaning of products for the operations of an industrial enterprise. Product development paradigm and defining relevant concepts. Realising product development methodologically (U&E model, Cooper's stage-gate model, QFD), managing innovations, and product development success factors.

Mode of delivery:

Face-to-face teaching and distance teaching.

Learning activities and teaching methods:

The course includes lectures and compulsory course work.

Target group:

Industrial engineering and Management students.

Prerequisites and co-requisites:

555223A Introduction to production control.

Recommended optional programme components:

-

Recommended or required reading:

Handouts, course work, and a collection of articles. Ulrich, K. & Eppinger, S. (2008) Product Design and Development. McGraw-Hill. 358 p.

Assessment methods and criteria:

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

Grading:

1-5

Person responsible:

Professor Harri Haapasalo.

Working life cooperation:

No.

Other information:

-

555223A: Introduction to Production Control, 3 op

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

   555226A   Operations and supply chain management   5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

3 ECTS credits.

Language of instruction:

Finnish

Timing:

Periods 3-4.

Learning outcomes:

The objective of the course is to provide students basic capabilities to work in the field of production planning and control. After passing the course the student should be able to: explain the basic concepts of production control, describe the objectives of production control and make some calculations related to production control, describe the production management system in different situations and explain the decisions at various levels, explain some basic production control and management tools and methods and solve some basic problems and also assess their relation to the success of an enterprise.

Contents:

Production management principles and production planning and control system, sales and operations planning, master planning of resources, material and capacity planning, and scheduling.

Mode of delivery:

Face-to-face learning.

Learning activities and teaching methods:

Lectures and exercises, homework.

Target group:

Industrial engineering and Management students.

Prerequisites and co-requisites:

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

Recommended optional programme components:

Recommended prerequisite: 555221P Introduction to production

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. The Chapters: 1. Operations as a Competitive Weapon, 2. Operations Strategy, 4. Process Strategy, 5. Process Analysis, 6. Process Performance and Quality, 9. Lean Systems, 10. Supply Chain Strategy, 12. Inventory Management, 13. Forecasting, 14. Sales and Operations Planning, 15. Resource Planning, 17. Scheduling.

Assessment methods and criteria:

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

555224A: Methods of Production Management and Logistics, 4 op

Voimassaolo: 01.06.2007 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Jukka Majava
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

ECTS Credits:

4 ECTS credits.

Language of instruction:

English.

Timing:

periods 1-3.

Learning outcomes:

The aim of the course is to familiarize a student with mathematical methods in production and logistics management. After completing the course, a student knows the most important mathematical methods for production and logistics management. A student will be able to apply these methods and solve the production and logistics problems of a company.

Contents:

Forecasting methods, simulation, queuing models, transportation algorithms and LP methods.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

The course includes lectures, exercises, and group work (/exam).

Target group:

Industrial engineering and Management students.

Prerequisites and co-requisites:

555223A Introduction to production control, knowledge of MS Excel or similar software.

Recommended optional programme components:

-

Recommended or required reading:

Applicable parts of Krajewski, L. et al. 2007. Operations Management – Processes and Value Chains. 8th edition. Pearson, Upper Saddle River. Additional material will be announced during the lectures.

Assessment methods and criteria:

Exercises and group work (/exam).
Read more about assessment criteria at the University of Oulu webpage.

Grading:

1-5

Person responsible:

Professor Pekka Kess

Working life cooperation:

No

Other information:

-

721704A: Business Logistics, 5 op

Voimassaolo: - 31.07.2005
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Oulu Business School
Arvostelu: 1 - 5, pass, fail
Opettajat: Jari Juga
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

555210A: Practice, 3 op

Opiskelumuoto: Intermediate Studies
Laji: Practical training
Arvostelu: 1 - 5, pass, fail
Opettajat: Eija Forsberg
Opintokohteen kielet: Finnish
Leikkaavuudet:

555204A   Internship   5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

3 ECTS credits.

Language of instruction:

Finnish.

Timing:

Periods 1-6.

Learning outcomes:

The objective is to familiarise students to industrial engineering and management in practical work life. During the course, students learn to observe his/her working environment from theoretical viewpoints of Industrial Engineering and Management (IEM). From the working environment, the student is able to identify IEM themes and classify them. The student is able to select theoretical references relevant for the topic and is able to evaluate the working environment based on the theoretical references. The student is able to draw up a report based on given instructions.

Contents:

To be defined by the student.

Mode of delivery:

Students will write a report concerning summer job. The length of the summer job has to be 2 months minimum.

Learning activities and teaching methods:

Students will write a report concerning summer job. Student's personal Omaope will review and grade the report.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

-

Recommended optional programme components:

Writing the written report is integrated with the course 900061A Scientific Communication for Production Engineering and Management.

Recommended or required reading:

-

Assessment methods and criteria:

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

Grading:

Approved/not approved.

Person responsible:

 omaopettaja

Working life cooperation:

Yes

Other information:

-

555284A: Problem Solving in Business Cases, 3 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Jaakko Kujala

Opintokohteen kielet: Finnish

Leikkaavuudet:

555287A   Problem Solving in Business Cases   5.0 op

ECTS Credits:

2 ECTS credits.

Language of instruction:

Finnish

Timing:

Periods 1-3.

Learning outcomes:

Objective: To learn to apply different problem solving methods in decision making related to a company's strategy or operations.
Learning outcomes: Upon completion the student can systematically analyse the challenges related to a company's business as a part of a group. He is able to develop and present alternative solutions to business challenges. He/she is able to analyse and develop the functioning of a group. Student is able to evaluate and improve his/her presentation skills.

Contents:

Changing content on topical subjects.

Mode of delivery:

Face-to-face learning.

Learning activities and teaching methods:

Case solving in groups, learning diary.

Target group:

Undergraduate students of IEM.

Prerequisites and co-requisites:

555220P Basic course in industrial engineering and management, 721172P Management accounting.

Recommended optional programme components:

-

Recommended or required reading:

Depending on the topic.

Assessment methods and criteria:

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

Grading:

1-5

Person responsible:

Professor Jaakko Kujala

Working life cooperation:

No

Other information:

-

555222A: Demonstration in Industrial Engineering and Management, 2 op

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

555226A   Operations and supply chain management   5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

2 ECTS credits.

Language of instruction:

Finnish

Timing:

Periods 1-3.

Learning outcomes:

Apply the basic concepts and calculations of microeconometria in an indusrial case.

Contents:

Business plan.

Mode of delivery:

Face-to-face teaching, group work.

Learning activities and teaching methods:

Lectures, group work.

Target group:

Industrial engineering and Management students.

Prerequisites and co-requisites:

555220P Basic course in industrial engineering and management.

Recommended optional programme components:

-

Recommended or required reading:

The study materials of the prerequisites.

Assessment methods and criteria:

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

Grading:

1-5

Person responsible:

Mirja Väänänen

Working life cooperation:

No.

Other information:

-

555281A: Basic Course of Quality Management, 5 op

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

    555286A   Process and quality management   5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
5 ECTS credits.
Language of instruction:
Finnish
Timing:

Periods 4-6.

Learning outcomes:

Objective: The objective of the course is to familiarise the student on managing production processes from the viewpoint of statistical process control.

Learning outcomes: Upon completion the student can explain the essential concepts of quality management and recognizes the significance of quality in different working environments. The student gains basic level skills for applying the methods of statistical process control. The student is able to solve problems of production process by using quality management problem solving methods.

Contents:

The significance of quality to a company, quality in open and closed systems, quality costs, quality tools and methods of statistical process control and the use of them in practical problem solving, basics of total quality management.

Mode of delivery:

Face-to-face learning.

Learning activities and teaching methods:

Lectures and exercises are integrated. A group study is made during the course. The final grade is determined by the group study and a final exam.

Target group:

-

Prerequisites and co-requisites:

None.

Recommended optional programme components:

-

Recommended or required reading:

Lecture materials, lecture handout and exercise book.

Assessment methods and criteria:

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

Grading:

1-5

Person responsible:

Osmo Kauppila

Working life cooperation:

No

Other information:

-

555282A: Project Management, 4 op

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

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

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
4 ECTS credits.

Language of instruction:

Finnish

Timing:

Periods 4-6.

Learning outcomes:

Objective: Upon completion the student should be able to apply the advanced concepts of project management.
Learning outcomes: Upon completion the student has a good understanding of central concepts of project management. The student is able to apply knowledge to execution and evaluation of different kinds of projects. The student can utilize articles published in scientific journals in the learning process.

Contents:

Managing project's objectives. Stakeholder management. Project risk management. Managing project's schedule and dependencies. Design Structure Matrix (DSM). Characteristics of different kinds of projects and managing them.

Mode of delivery:

Face-to-face learning.

Learning activities and teaching methods:

Lectures, group work and learning report. Active participation to lectures required.

Target group:

-

Prerequisites and co-requisites:

-

Recommended optional programme components:

555280P Basic course of project management or equivalent knowledge recommended.

Recommended or required reading:

Lecture materials and supplementary readings announced in the course. Artto, Martinsuo & Kujala 2006. Projektiliiketoiminta. WSOY, ISBN: 951-0-31482-X, available at http://pbgroup.aalto.fi/en /the_book_and_the_glossary/

Assessment methods and criteria:

Pre-examination to ensure required level of knowledge in the beginning of the course, group work, learning report
Read more about assessment criteria at the University of Oulu webpage.

Grading:

1-5

Person responsible:

Professor Jaakko Kujala

Working life cooperation:

No

Other information:

-

555261A: Basic Course in Occupational Psychology, 3 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Kisko, Kari Juhani
Opintokohteen kielet: Finnish
Leikkaavuudet:

555264P   Managing well-being and quality of working life   5.0 op
ay555261A   Basic Course in Occupational Psychology (OPEN UNI)   3.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

3 ECTS credits.

Language of instruction:

Finnish.

Timing:

Periods 3-4.

Learning outcomes:

Upon completion the student understands the role of a human being as a member of the work community and as a worker. The student can explain the effects that differences between people, work motivation, work based stress, work groups and work teams cause on the work community.

Contents:

Occupational psychologic research, evaluation and development. Human views in psychology. The scope, aims and point of view of occupational psychology in an organization. The psychological structures of the work process and an organization. The structure and moderation of work activity, learning, motivation, interaction, well-being at work, quality of work, change skills. Introduction to evaluating and developing work processes, organizations and products from a occupational psychology viewpoint.

Mode of delivery:

Contact teaching.

Learning activities and teaching methods:

Lectures, exercises and seminars.

Target group:

-

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Arnold, J. (2005) Work Psychology; Understanding Human Behavior in the Workplace. Prentice Hall, ISBN: 978-0-273-71121-6.

Assessment methods and criteria:

Lectures, exercises, seminars or alternatively an exam based on the course book.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical 1-5/fail.

Person responsible:

Lecturer Kari Kisko.

Working life cooperation:

No.

Other information:

-

721412P: Product and Market Strategies, 5 op

Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Oulu Business School
Arvostelu: 1 - 5, pass, fail
Opettajat: Ilkka Ojansivu
Opintokohteen kielet: Finnish

Leikkaavuudet:

ay721412P   Product and Market Strategies (OPEN UNI)   5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish.

Timing:

Autumn semester/Period A.

Learning outcomes:

After having passed this course, students are able to identify the concepts and tools linked to product and market strategies. The course improves students' ability to evaluate different product and market situations among industries and propose solutions to strategic product/market decisions. Furthermore, students are able to explain the content and stages of the value delivery process.

Contents:

1) Discovering the required value, 2) Developing a suitable customer offering, 3) Delivering the value 4) Communicating the value

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

27 h lectures, related discussions and group works, case exercise with both written and verbal part (62 h), case presentations (14 h) and independent reading of the textbooks and related material (20 h). During the course students will work in small groups and meet regularly in order to solve a marketing challenge proposed by the case company (case company is the same for all groups). Problem based learning (PBL) method will be applied and students play different roles to simulate tasks of the real life marketing professionals. Relating to these roles, students will write a learning diary (10 h). In the end of the course students will return a written report as a solution for the marketing challenge and presents it to other students.

Target group:

Students who are completing major/minor in marketing

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Kotler, P., Keller, K., Brady, M., Goodman, M. & Hansen, T. (2009 tai 2012) Marketing Management (1st or 2nd European Edition), Porter, M.E. (1985) Competitive Advantage and other material named by the lecturer.

Check availability from here.

Assessment methods and criteria:

Lectures and case exercise. The written part of the case exercise will determine 80% and the verbal part 20% of the grade. The assessment of the course unit is based on the learning outcomes of the course unit. 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:

Doctoral student Ilkka Ojansivu.

Working life cooperation:

-

Other information:

The number of students is limited.

900062P: Communicative Oral Skills for Production Engineering and Management, 2 op

Voimassaolo: 01.08.2008 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Language Centre
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Proficiency level:

-

Status:

This course is obligatory for the Students of Industrial Engineering and Management and it is integrated to the Case course 555284A.

Required proficiency level:

-

ECTS Credits:

2 ECTS

Language of instruction:

Finnish

Timing:

the Autumn term of the 3rd year of studies

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 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. The student knows how to act efficiently in situations of group communication.

Contents:

Presentations, preparing a presentation, presenting techniques, argumentation, non-verbal communication, negotiating skills and conventions, observation and analysis of speech communication situations.

Mode of delivery:

multi-modal teaching

Learning activities and teaching methods:

Contact teaching and independent work

Target group:

Students of Industrial Engineering and Management

Prerequisites and co-requisites:

-

Recommended optional programme components:

This course is integrated to the Case course 555284A.

Recommended or required reading:

the material in the Optima learning 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:

1 - 5

Person responsible:

Niina Sarajärvi

Working life cooperation:

-

Other information:

-

Choose one of these

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.

Choose one of them

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.

Choose here 521141P Elementary Programming or 811192PIntroduction to Programming in C

521141P: Elementary Programming, 5 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Computer Science and Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Riekki, Jukka Pekka

Opintokohteen kielet: Finnish

Leikkaavuudet:

   ay521141P   Elementary Programming (OPEN UNI)   5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5

Language of instruction:

Finnish, the course can be completed in English by answering the lecture questions and doing the programming exercises and the final exercise.

Timing:

Fall, periods 1-3.

Learning outcomes:

Upon completing the required coursework, the student is able to explain the basic programming concepts and structures and to solve problems using these concepts and structures. Moreover, the student is able to implement small programs independently.

Contents:

Basic concepts of programming, basic structures of programming languages, solving problems by programming.

Mode of delivery:

Web-based teaching + face-to-face teaching

Learning activities and teaching methods:

Study materials web. 20 h lectures with intergrated exercises; in addition, appr. 10 h voluntary guided practising, the rest as independent work.

Target group:

1 st year students of computer science and engineering and electrical engineering and other Students of the University of Oulu.

Prerequisites and co-requisites:

None.

Recommended optional programme components:

The course provides a basis for subsequent programming courses.

Recommended or required reading:

Will be announced at the beginning of the course.

Assessment methods and criteria:

Students answer questions after each lecture and do the programming exercises and the final exercise. Assessment is based on these three elements; passing the course requires points from each element. More detailed information on assessment can be found from http://www.oulu.fi/cse/studying/courses. 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:

Jukka Riekki

Working life cooperation:

-

811192P: Introduction to Programming in C, 5 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Department of Information Processing Science

Arvostelu: 1 - 5, pass, fail

Opettajat: Ilkka Räsänen

Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS credits/134 hours of work

Language of instruction:

Finnish

Timing:

1st year, autumn semester, period 2+3

Learning outcomes:

After completing the course the student is able to design a programme by splitting main problem into solvable sub problems. The outcome of design process is modules which she/he is able to write by using chosen programming language. Student is able to use selection and loop structures to control execution of a module and control execution between modules. Student is able to use basic data types for saving and processing data and she/he is able to use right operations to this data. Student is able to use arrays to handle large amounts of same type of data and is able to use control structures to flexibly manipulate the data of arrays. Student is able to use pointers for example to enhance passing large amount of data between modules and at the same time taking care of the risks of using pointers. Student is able to use structured data types that contain fields of different data types and is able to manipulate the fields of these data structures. Student is able to programmatically use files to save permanently large amount of data she /he is able programmatically read data from files for further processing.

Contents:

1. Software design method (waterfall)
2. Problem solving
3. Stepwise refinement
4. Control structures
5. Modular programming, calling modules, communication between modules
6. Data types
7. Arrays
8. Pointers

9. Character strings
10. Data structures
11. File processing

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 40h, exercises 24h, self-study 70h.

Recommended or required reading:

Deitel, Deitel: C HOW TO PROGRAM; Pearson Education Inc. 2007

Assessment methods and criteria:

1. Final exam and exercise points; and 2. Weekly exams and exercise points.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

1-5

Person responsible:

Ilkka Räsänen

Working life cooperation:

No

A440121: Module Preparing for the Option, Mechanical Engineering (obligatory studies), 20 - 21 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 Studies of Mechanical Engineering

461016A: Statics, 5 op

Voimassaolo: - 31.07.2021
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Lahtinen, Hannu Tapio
Opintokohteen kielet: Finnish
Leikkaavuudet:

ay461102A   Statics (OPEN UNI)   5.0 op
461102A   Statics   5.0 op

ECTS Credits:

5 ects cr

Language of instruction:

Finnish

Timing:

Lectures and exercises, periods 1-3

Learning outcomes:

The aim of this course is to give an understanding of the static equilibrium of structures and skills to balance force systems. This course also prepares students for later studies.
Learning outcomes: After the course, the student can calculate forces and moments of loaded structures using equations of vector algebra and trigonometry. He/she can draw a free body diagram of the force system and then solve the unknown forces by using equations of equilibrium. He/she can determine resultants from uniformly distributed loads and apply Coulomb's law of friction in the problem equilibrium. The student can solve problems of internal and external forces of particle systems and rigid body systems in case of static equilibrium. Especially, he/she can draw shear force and bending moment diagrams for beam structures.

Contents:

Fundamental laws and concepts in statics; Force systems and their treatment; Equilibrium of particles and rigid bodies; Static forces in isostatic structures such as beams, frames, cables and trusses; Friction; The principle of virtual work for rigid bodies; Stability of equilibrium.

Mode of delivery:

Face-to-face -teaching.

Learning activities and teaching methods:

Lectures and exercises take place at autumn periods 1-3. Four mid-term exams or one final exam required.

Target group:

 -

Prerequisites and co-requisites:

 -

Recommended optional programme components:

 -

Recommended or required reading:

Salmi, T.: Statiikka, Pressus Oy, Tampere 2005; Beer, F., Johnston, R.: Vector Mechanics for Engineers, Statics, McGraw-Hill Book Company, 1990; Meriam, J.: Statics, SI version, 2 ed., New York, London, 1975.

Assessment methods and criteria:

Four mid-term exams or one final exam required.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

numerical 1-5/fail

Person responsible:

Hannu Lahtinen

Working life cooperation:

No

Other information:

 -

463052A: Introduction to Manufacturing Technology, 5 op

Voimassaolo: - 31.07.2021

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

   463101A   Introduction to manufacturing technology   5.0 op

ECTS Credits:

5 ects

Language of instruction:

Finnish

Timing:

Spring, lectures 10 h, period 4, exercises periods 4 -5

Learning outcomes:

The aim of this course is to give students a general view of manufacturing methods. The primary emphasis of the course is on the cutting methods of metals.
Learning Outcomes: Upon completion of the course, the student is able to name the central areas of manufacturing technology and the most important cutting methods. In addition, the student is able to choose the applicable cutting methods and tools for achieving the basic manufacturing tolerances. The student is able to explain the basic features of the most usual materials of cutting tools.

Contents:

The course includes 10 hours lectures, an examination and the practical exercises of metal cutting in the laboratory.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

In the spring, 10 hours of lectures and exercises will be held during periods 4 and 5. The exam and exercises will be graded 0-5. The final grade is based on the combined points from exercises and the final exam.

Target group:

-

Prerequisites and co-requisites:

No

Recommended optional programme components:

 -

Recommended or required reading:

Copies of lecture material, other material to be notified at the start of lectures.
Ihalainen, E., Aaltonen, K., Aromäki, M., Sihvonen, P.: Valmistustekniikka. Otatieto Oy: Helsinki, 2007, 490 p.

Assessment methods and criteria:

Exam and exercises are graded 1-5. Half of the final grade is based on the grade of the exercises and another half of the final grade is based on the grade of the exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 1-5

Person responsible:

Martti Juuso

Working life cooperation:

No

Other information:

 -

461018A: Dynamics, 4 op

Voimassaolo: - 31.07.2021
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Koivurova Hannu
Opintokohteen kielet: Finnish
Leikkaavuudet:

   461106A   Dynamics   5.0 op

ECTS Credits:

4 ects

Language of instruction:

Finnish

Timing:

Lectures and exercises, periods 4 -6

Learning outcomes:

The aim of this course is to provide students with the ability to examine the relationship between the forces on a solid body and the resulting motion, position, speed and acceleration of the body.
Learning outcomes: Upon completing the required coursework, the student knows and is able to explain the fundamental quantities and the base laws of the classical mechanics. He/she is able to choose an appropriate coordinate system and analyze the motion - position, velocity, and acceleration - of the parts of a device. The student is able to draw a free body diagram of a moving system, and compose and derive the equations of motion for a system using the direct momentum method, the work-energy method, and the impulse-momentum method.

Contents:

Introduction; Kinematics of a particle; Plane kinematics of a rigid body; Kinetics of
a particl;. Basics of mechanical vibrations; Kinetics of a system of particles; Plane kinetics of a
rigid body

Mode of delivery:

Face-to-face

Learning activities and teaching methods:

The course is based on lectures and exercises. The students will be informed about the practical arrangements at the beginning of the course. The final grade is based on the combined points from exercises and three exams.

Target group:

-

Prerequisites and co-requisites:

-

Recommended optional programme components:

Statics, Basis of Integral and Differential Calculus and Vector and Matrix Algebra.

Recommended or required reading:

Salmi, T. (2003) Dynamiikka 1, kinematiikka, Pressus; Salmi, T. (2002) Dynamiikka 2, kinetiikka, 2. p.; Pressus. Beer, F., Johnston, E. (1996) Vector Mechanics for Dynamics, 6.ed., McGraw-Hill.

Assessment methods and criteria:

Intermediate exams or a final exam.   Homeworks.
The final grade is based on the combined points from exercises and three exams.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 1-5.

Person responsible:

Hannu Koivurova

Working life cooperation:

 -

Other information:

 -

461010A: Strength of Materials I, 7 op

Voimassaolo: - 31.07.2021
Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Lahtinen, Hannu Tapio

Opintokohteen kielet: Finnish

Leikkaavuudet:

   461103A   Strength of materials I   5.0 op

ECTS Credits:

7 ects

Language of instruction:

Finnish

Timing:

Lectures and exercises take place during the spring periods 4 - 6.

Learning outcomes:

The aim of this course is to give fundamental concepts in the field of strength of materials and provide a capability to dimension such basic structures as tension and compression bars, torsion bars and and beams.
Learning outcomes: After the course, the student can determine stresses and strains of structures under loading. He/she can change the general stress and strain states from one coordinate system to another and can also apply constitutive equations in calculations. The student can dimension typical structures such as tension and compression bars, torsion bars, straight beams and buckling struts.

Contents:

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

Mode of delivery:

Face-to-face

Learning activities and teaching methods:

Lectures and exercises take place during the spring periods 4 - 6. Four midterm exams or one final exam is required.

Target group:

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Prerequisites and co-requisites:

  -

Recommended optional programme components:

Statics

Recommended or required reading:

Outinen, H., J., Salmi, T.: Lujuusopin perusteet, Pressus Oy, Tampere, 2004, Pennala, E.: Lujuusopin perusteet, Moniste 407, Otatieto 2002; Karhunen, J. & al.: Lujuusoppi, Otatieto 2004; Ylinen, A.: Kimmo- ja lujuusoppi I ja II, WSOY. 1976. Beer, F., Johnston, E., Mechanics of materials , McGraw-Hill, 1992

Assessment methods and criteria:

Midterm exams or one final exam is required.
The final grade is based on the combined points from exercises and exams.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 1-5.

Person responsible:

Hannu Lahtinen

Working life cooperation:

-

Other information:

-

A440122: Module Preparing for the Option, Mechanical Engineering (optional studies), 19 - 20 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Module Preparing for the Option

Laji: Study module

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Electives

461011A: Strength of Materials II, 7 op

Voimassaolo: - 31.07.2021

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Laukkanen, Jari Jussi

Opintokohteen kielet: Finnish

Leikkaavuudet:

461104A   Strength of materials II   5.0 op

ECTS Credits:

7 ects

Language of instruction:

Finnish

Timing:

Lectures and exercises take place during the periods 1. -3.

Learning outcomes:

The aim of this course is to provide students with a general view of the different areas concerning the strength of materials.

Learning outcomes **:** Upon completion of the course, the student should be able to use the basic methods of fatigue strength estimation and fracture mechanics to estimate the life of simple structures. He/she is also able to solve the problem concerning the buckling of columns and beam columns. Moreover,the student is able to solve the problem of the bending of curved beams and free and warping torsion of beams. After this course the student will have the basic skills to form linear visco-elasticity models.

Contents:

Basic methods of fatigue strength estimation; Basics of fracture mechanics; Buckling of columns and beam columns; Bending of curved beams; Free and warping torsion; Linear visco-elasticity

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

This course will be based on lectures and exercises during periods 1 - 3 and will have a final exam or mid-term exams.

Target group:

-

Prerequisites and co-requisites:

-

Recommended optional programme components:

Statics and Strength of Materials I

Recommended or required reading:

Pennala, E.: Lujuusopin perusteet, Moniste 407, Otatieto, 1998; Outinen, H., Koski, J., Salmi, T.: Lujuusopin perusteet, Pressus Oy: Tampere, 2000; Salmi, T., Virtanen, S.: Materiaalien makaniikka, Pressus Oy: Tampere, 2008; Ylinen, A.:Kimmo- ja lujuusoppi I ja II. WSOY, 1976; Bära brista, grundkurs i hållfasthetslära, AWE/Gebers: Stockholm, 1979.

Assessment methods and criteria:

Midterm exams or one final exam is required.
After the passed exercises a student is allowed to take part in an exam.

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

Grading:

Numerical grading scale 1-5.

Person responsible:

Jari Laukkanen

Working life cooperation:

 -

Other information:

 -

464055A: Machine Design I, 8 op

Voimassaolo: 01.08.2005 - 31.07.2021

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

464102A	Design of machine elements	10.0 op
462033A	Machine Design	7.0 op

ECTS Credits:

8 ects

Language of instruction:

Finnish

Timing:

Lectures, periods 1 -3.   Exercises, periods 3-4, and practical work, period 6

Learning outcomes:

Upon completion of this course, the student will know operating principals, material selection and dimensioning of machine elements.
Learning outcomes: Upon completion of this course, the student is able to measure dimensions of the machine elements.

Contents:

Joint elements (screws, welds, etc.); Rotating machine elements (shafts, bearings, clutches, brakes); Power transmission elements (gears, chains, belts, etc.); Basics of needed vibration isolation to ensure smooth operation of machines

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

The course's lectures will take place during periods 1 – 3 for second year students. Exercises are held during periods 3 and 4. The design exercise is done during periods 5 and 6. There will be two mid-term exams or a final exam. The student's ability to start a design exercise is evaluated based on exams and exercises. The design exercise has to be completed during the same study year as the other parts of the course. The final grade is the average of the exam and exercise grades.

Target group:

-

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Airila, M.& al. Koneenosien suunnittelu. Porvoo WSOY, 1995; Shigley, J. E. ja Mischke, C. R. Mechanical Engineering Design. New York, McGraw-Hill,1983.

Assessment methods and criteria:

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

Grading:

Grading 1-5

Person responsible:

Prof. Jouko Karhunen

Working life cooperation:

-

Other information:

-

464051A: Machine Drawing, 3,5 op

Voimassaolo: 01.08.2005 - 31.07.2021

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Tapio Korpela

Opintokohteen kielet: Finnish

Leikkaavuudet:

   464101A   Machine drawing and CAD   5.0 op

Learning outcomes:

The aim of the course is to teach students to read and to draw machine drawings and to carry out standard specifications of description methods, legends and dimensioning.
Learning outcomes: After the course, the student is able to read machine drawings and he/she is able to draw them according to the standardized projection methods, legends and dimensioning.

Contents:

Purpose of machine drawing; Description and dimensioning of parts; Design and viewpoints of manufacturing; Specifications of welds and surface roughness and tolerances on drawings; Principles of diagrammatic drawings

Mode of delivery:

Face-to-face

Learning activities and teaching methods:

Lectures and problem solving exercises are held in the first and the second period. A personal exercise work is done during the third period. After the passed problem solving exercises and the personal exercise work a student is allowed to take part in an exam. Half of the final grade is based on the grade of the exercises and another half of the final grade is based on the grade of the exam.

Target group:

-

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Pere, A.: Koneenpiirustus1 & 2, Kirpe Oy, Espoo;
The students will be informed about the practical arrangements at the beginning of the course.

Assessment methods and criteria:

Half of the final grade is based on the grade of the exercises and another half of the final grade is based on the grade of the exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 1-5 / fail

Person responsible:

Tapio Korpela

Working life cooperation:

-

Other information:

-

463053A: Manufacturing Technology I, 3,5 op

Voimassaolo: - 31.07.2021

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Lappalainen, Kauko Tapio

Opintokohteen kielet: Finnish

Leikkaavuudet:

463102A	Manufacturing technology I	5.0 op
463053A2	Manufacturing Technology I	5.0 op

ECTS Credits:

3,5 ects

Language of instruction:

Finnish

Timing:

Lectures and exercises take place during the spring periods 4 - 5.

Learning outcomes:

The objective of the course is to familiarize students with the fundamentals of the functions and manufacturing methods of an engineering workshop. In order to apply manufacturing technology, students must know the features of different alternatives and be able to make technically and economically correct choices and combinations. This course emphasizes practicality and a general view of production. Learning outcomes: After the course, the student is capable of explaining manufacturing functions and

methods of an engineering workshop. He/she is able to select parts manufacturing methods, machining data, machine tools and tooling equipment. In addition he/she can evaluate the alternatives of production automation in manufacturing functions.

Contents:

Features of different machining methods and machine tools; Selection of a blank machining method and machine tool according to type of work piece, accuracy and volume of production; Costs and technological possibilities of different machining methods; A review of control techniques, programming, jigs and tools

Mode of delivery:

Face-to-face -teaching.

Learning activities and teaching methods:

Lectures and exercises are held during periods 4 and 5. The course will be passed with a final exam and exercises which need to be returned and accepted. The final grade is a combined result of exercises and a final exam.

Target group:

-

Prerequisites and co-requisites:

-

Recommended optional programme components:

463052A Introduction to Manufacturing Technology

Recommended or required reading:

Materials include lecture notes and exercise materials. The material that is in English will be given distributed at the lectures.

Assessment methods and criteria:

Final exam,
The final grade is based on the combined points from exercises (grading 0,3) and the finai exam (grading 0,7).
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 1-5.

Person responsible:

Prof. Kauko Lappalainen

Working life cooperation:

-

Other information:

-

465061A: Materials Engineering I, 5 op

Voimassaolo: 01.01.2006 - 31.07.2021
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Leinonen, Jouko Iivari
Opintokohteen kielet: Finnish
Leikkaavuudet:

465101A   Introduction to materials for mechanical engineering   5.0 op

ECTS Credits:

5 ects

Language of instruction:

Finnish; Laboratory exercises also in English

Timing:

Lectures and exercises take place during the periods 1. -2. and exercises in the laboratory, periods 1. -3.

Learning outcomes:

The objective of the course is to familiarize the student with basic matters concerning properties of metallic and non-metallic structural materials, the area within which the materials are in use, and the principles of materials selection.

Learning outcomes: After the course, the student is able to explain the measurement of mechanical properties by using different material testing methods and draw conclusions from the measurement results. He/she is able to separate corrosion properties of different metals can apply different corrosion protection methods. The student is also able to classify steels, cast irons, non-iron metals, plastics and structural ceramics. He/she can explain phase diagrams of metal alloys. The student masters structural materials and their selection so that he/she is able to select the most proper structural material for a product or component.

Contents:

Common structural materials in mechanical engineering; Materials selection taking into account different demands.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

The course is made up of lectures, a materials selection exercise in small group during periods 1 and 2 and three laboratory exercises in small groups during periods 1 - 3. The final grade is based on the points from the final exam or small exams (weight 3) and from the materials selection exercise (weight 1). The laboratory exercises will be graded as pass/fail. The course is recommended to be completed during the second study year.

Target group:

 -

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Lecture booklet (in Finnish); Exercise materials

Assessment methods and criteria:

The final grade is based on the combined points from exercises (1) and exams (3). Passed exercises. Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 1-5 / fail.

Person responsible:

Jouko Leinonen

Working life cooperation:

-

Other information:

-

555361A: Machine Safety and Usability, 3,5 op

Opiskelumuoto: Advanced Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Seppo Väyrynen
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

ECTS Credits:

3,5 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 able to choose the design and management methods that enable the organization to remove risks especially on machines and products, and secondly to increase the usability of machines and products and user-friendliness of the work stations. He is able to apply the course's contribution to the company fulfilling the EU´s obligations under the newest regulation. The student knows the responsibilities for risk control and opportunities of high quality well-being and usability in design and management.

Contents:

The course makes students familiar with the design of machinery, product or plant, which is characterized by proper usability and safety features. The course also develops the abilities to analyse, enhance and maintain a high level of safety and productivity by means of modern management and leadership. Additionally, the new EU and global standardization and harmonization of machine safety. Safety analysis. Work accidents related to machines. Ergonomics and usability in design which, in addition to safety, promote user experience as a part of usability of products and well-being at work.

Mode of delivery:

Face-to-face teaching, blended teaching.

Learning activities and teaching methods:

Lectures 20 h. The rest of learning comprises teaching without guidance either privately or in a group. The exercises are mainly completed as group work.

Target group:

Mainly for students from the Department of Mechanical Engineering.

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Väyrynen, Nevala & Päivinen (2004) Ergonomia ja käytettävyys suunnittelussa, Teknologiateollisuus ry. 336 s. ISBN: 951-817-848-8 (soveltuvin osin); MetSta-verkkojulkaisu: http://www.metsta.fi/koneturvallisuus/ ; Väyrynen, S. (2011) Johdanto koneturvallisuus ja käytettävyys –kurssiin. Pdf-moniste; Käyttöasetuksen soveltamissuosituksia, Työsuojelujulkaisuja 91. Työsuojeluhallinto 2009; Koneturvallisuus. Koneiden tekniset vaatimukset ja vaatimustenmukaisuus. Työsuojeluoppaita ja -ohjeita 16. Työsuojeluhallinto 2008; Kone-, tuotanto- ja materiaalitekniikka. Koneiden turvallisuus. SFS-käsikirja 403. Suomen Standardisoimisliitto 2009; www.sfsedu.fi ja www.metsta.fi (kts. tietoja koneturvallisuus ja ergonomiastandardeista); http://www.finlex.fi (kts. laki 738/2002, asetus 400/2008, asetus 403/2008); TSO-5: Pienyrityksen työympäristö tuloksen tekijänä. Aluehallintovirasto 2012; Dul, J & Weerdmeester, B (2008): Ergonomics for beginners: a quick reference guide. 3rd ed. CRC Press; www.vtt.fi/proj /riskianalyysit/.

Assessment methods and criteria:

Exam and exercises from which only main ones are compulsory.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

1-5

Person responsible:

proProfessor Seppo Väyrynen and Tatu Prykäri

Working life cooperation:

No.

Other information:

-

461033A: Finite Element Methods I, 3,5 op

Voimassaolo: 01.08.2007 - 31.07.2021

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Lumijärvi, Jouko Veikko Juhani

Opintokohteen kielet: Finnish

Leikkaavuudet:

461107A	Finite Element Methods I	5.0 op
461014S	Finite Element Methods	5.0 op

ECTS Credits:

3,5 ects

Language of instruction:

Finnish

Timing:

Lectures and exercises, periods 1. - 2.

Learning outcomes:

The aim of this course is for students to gain an understanding of the
basic idea and restrictions of FEM and the preparedness to the use of commercial FE-programs.
Learning outcomes: After this course, the student can explain the basic idea of the FEM. He/she can
analyze simple truss- and frame structures and explain the theoretical background of the calculations. In
addition, the student can analyze two-dimensional and heat transfer problems by using FEM.

Contents:

The basic idea of FEM and its use in static analyses of bars, beams and plane structures. Some general
principles of the use of FEM.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures and exercises take place during periods 1 and 2. The course can be passed either by completing
two mid-term exams or a final exam

Target group:

-

Prerequisites and co-requisites:

-

Recommended optional programme components:

Strength of Materials I and II.

Recommended or required reading:

Lecture notes (in Finnish), N. Ottosen & H. Petersson: Introduction to the Finite Element Method,
NAFEMS: A Finite Element Primer, O. C. Zienkiewcz & R. L. Taylor: The Finite Element Method, 4th ed,
Vol. 1: Basic Formulation and Linear Problems.

Assessment methods and criteria:

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

Grading:

Numerical grading scale 1-5.

Person responsible:

 Jouko Lumijärvi

Working life cooperation:

 -

Other information:

 -

462021A: Machine Automation I, 5 op

Voimassaolo: 01.08.2005 - 31.07.2021

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Pekka Tyni

Opintokohteen kielet: Finnish

Leikkaavuudet:

   462102A   Machine automation actuators   5.0 op

ECTS Credits:

5 ects

Language of instruction:

Finnish

Timing:

Lectures, periods 4. -5.   Groupwork exercise, periods 5.-6.

Learning outcomes:

The objective of the course is to have students take into consideration electrical, pneumatic and hydraulic actuator systems when designing modern machines.
Learning outcomes: Upon completion of the course, a student should be capable of explaining the operational principle of pneumatic system. He/she is able to design a small system with pneumatic actuators and other necessary components. He/she is also able to select a programmable controller for a small system and program it.

Contents:

Pneumatic, hydraulic and electric actuators for machine automation and their use; Fundamentals of control of machines, designing a logical control; Constructions and operation principles of programmable controllers

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Teaching is arranged during the spring term. Lectures are during periods 4 and 5, and the exercises take place during periods 5 and 6. An exercise assignment and a written exam are required.

Target group:

-

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Hulkkonen Veli: Pneumatiikka
I, 6. painos, 1991, s. 1...140; Fonselius,
Hautanen, Mutikainen, Pekkala, Salmijärvi,

Simpura: Pneumatiikka, 8. painos, 1997.

Assessment methods and criteria:

Final exam

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

Grading:

Numerical grading scale 1-5.

Person responsible:

Pekka Tyni

Working life cooperation:

-

Other information:

-

465077A: Welding Technology, 3,5 op

Voimassaolo: - 31.07.2021

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Leinonen, Jouko Iivari

Opintokohteen kielet: Finnish

Leikkaavuudet:

   465104A   Heat treatment and welding of metals   5.0 op

ECTS Credits:

3,5 ects

Language of instruction:

Finnish, Laboratory exercises also in English

Timing:

Lectures, period 1. and exercises in laboratory, period 2.

Learning outcomes:

The objective of the course is to familiarize the student with conventional welding processes, weldability of different materials, the possibilities and conditions of welding technology in product design, and to give the student the ability to solve problems occurring in welding production.
Learning outcomes: After the course, the student is able to explain the most essential principles and applications of the conventional welding and cutting processes. He/she is able to estimate weldability of different materials and to analyze the factors affecting weldability. He can also explain the most essential matters regarding welding mechanization and automation, weld defects and their inspection, fatigue strength of a structure, and a healthy working environment. In addition, the student is generally able to take into account the effects of productivity and costs on the competitiveness.

Contents:

Welding processes and their applicability; Weldability of steels and other metallic materials; Welding distortions, weld defects, and inspection methods; Design of welded joint; Welding costs

Mode of delivery:

Face- to-face teaching.

Learning activities and teaching methods:

The course is made up of lectures, welding exercises (in laboratory) during period 1. The final grade is based on the points from the final exam or two small exams. The course is recommended to be completed during the second study year.

Target group:

-

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Study material: Lecture booklet (in Finnish)
Additional material: Lukkari, J.: Hitsaustekniikka. Perusteet ja kaarihitsaus. Edita: Helsinki, 1997.

Assessment methods and criteria:

Midterm exams or one final exam is required.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 1-5.

Person responsible:

Jouko Leinonen

Working life cooperation:

-

Other information:

-

464056A: Machine Design II, 6 op

Voimassaolo: 01.08.2007 - 31.07.2021

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Juuma, Teuvo Kalervo

Opintokohteen kielet: Finnish

Leikkaavuudet:

   464103A   Machine design   5.0 op

ECTS Credits:

6 ects

Language of instruction:

Finnish

Timing:

Lectures, periods 2. -3. and exercises periods 4 -6.

Learning outcomes:

Upon completion of this course, the student is familiar with numerous starting points used in design, dimensioning and material selection of machine elements.
Learning outcomes: Upon completion of this course, the student is able, as a member of a design group, to design an entire machine, explain material selections and answer for meaning to be responsible of dimensioning of machine elements.

Contents:

Welded structures and frames; Casted structures; Joints of structures; Shaft structures; Hub joints; Drives; Bearing arrangements; Lubrication; Design of machine foundations.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

The course's lectures will take place during periods 2 and 3 for third year students. The design exercise is done during periods 4 – 6. The final grade is the average of the exam and exercise grades.

Target group:

-

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Airila, M.& al. Koneenosien suunnittelu. Porvoo WSOY, 1995; Shigley, J. E. ja Mischke, C. R. Mechanical Engineering Design. New York, McGraw-Hill,1983. Tuomaala, J. Koneensuunnitteluoppi, first part. Oulu, 1995.

Assessment methods and criteria:

Half of the final grade is based on the grade of the exercise and another half of the final grade is based on the grade of the exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 1 -5.

Person responsible:

Jouko Karhunen

Working life cooperation:

-

Other information:

-

464061A: Techniques of Creative Working, 3 op

Voimassaolo: - 31.07.2021
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Niskanen, Juhani
Opintokohteen kielet: Finnish
Leikkaavuudet:

   464104A   Product innovations   5.0 op

ECTS Credits:

3 ects

Language of instruction:

Finnish

Timing:

Lectures during period 1.

Learning outcomes:

The objective of the course for the student to learn to find problems in a familiar environment, analyze them and implement mechanical engineering to solve the problems.
Learning outcomes: Upon completion of the course, the student is able to convert a familiar condition to a problem requiring a technical solution and question existing solutions. The student is able to apply the most important methods of systematic creative working.

Contents:

Analyzing and abstracting of a problem; Connecting a problem to a larger context or its division to minor problems; Applying systematic methods to a defined problem

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

The course includes an introductory lesson and guided exercises during lessons. The course also includes a separate group work from a topic that has come up during lessons. This course will have an exam and group work. The final grade is the average of exam and group work. Those who have done the exercises during the lessons are required to answer only half of the questions in the exam.

Target group:

-

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Jorma Tuomaala: Luovan työn tekniikka.

Assessment methods and criteria:

Final exam and practical work.
Read more about assessment criteria at the University of Oulu webpage.

Person responsible:

prof. Juhani Niskanen

Working life cooperation:

-

Other information:

-

465071A: Introduction to Materials Science, 3,5 op

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

ECTS Credits:

3,5 ects

Language of instruction:

Finnish; Laboratory exercises also in English

Timing:

Lectures will be held during period 4, and the three laboratory exercises in small groups will be during periods 5 and 6.

Learning outcomes:

The student will know the fundamental principles of materials science and the most important physical phenomena occurring in solid state of metallic structures.
Learning outcomes: After the course, the student is able to explain the fundamental characteristics of crystalline structure and special features attached. He/she is able to judge the effects of plastic deformation on metal structure and mechanical properties. In addition, he/she is able to present recovery and recrystallization of cold deformed metal and their significance in practice. Based on a phase diagram, the student is capable of estimating the microstructure of a metal alloy after solidification and phase transformations appearing in a solid state. He/she is also able to explain behavior of metal under pressure in cases of different type stresses and at different temperatures.

Contents:

Crystalline structure of metals; Plastic deformation, recovery and recrystallization; Phase diagrams; Phase transformations; Behavior of metal under pressure

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures will be held during period 4, and the three laboratory exercises in small groups will be during periods 5 and 6. The final grade is based on the points from the final exam or small exams. The laboratory exercises will be graded as pass/fail. The course is recommended to be completed during the third study year.

Target group:

-

Prerequisites and co-requisites:

-

Recommended optional programme components:

Materialtechnolgy I

Recommended or required reading:

Lecture booklet (in Finnish); Exercise materials
Additional material: Lindroos, V, Sulonen, M.,Veistinen, M.: Uudistettu Miekk-ojan metallioppi. Otava: Helsinki, 1986.

Assessment methods and criteria:

The final grade is based on the points from the final exam or small exams. The laboratory exercises will be graded as pass/fail.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 1-5.

Person responsible:

Jouko Leinonen

Working life cooperation:

-

Other information:

-

465095A: Sheet Metal Forming, 3,5 op

Voimassaolo: - 31.07.2021
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Jari Larkiola
Opintokohteen kielet: Finnish
Leikkaavuudet:

   465103A   Principles of metal shaping and forming   5.0 op

ECTS Credits:

3,5 ects

Language of instruction:

Finnish

Timing:

Lectures during period 6.

Learning outcomes:

The aim of the course is to supply the student with a basic understanding of the plasticity theory and sheet metal forming methods.
Learning outcomes: Upon completing the required coursework, the student knows different manufacturing

methods and, based on this information, can make the right decisions in connection with the making of the desired product and the choice of the suitable manufacturing method. Furthermore, the student can propose suitable materials for the different applications by also paying attention to the manufacturing costs. Among others, the plasticity theory is used as a support mechanism of the decision-making.

Contents:

During the course the mechanical testing methods of metals, the plasticity theory, the effect of material properties on the forming and the forming methods of sheet metal are studied.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures will make up 24 hours of the course. Furthermore, the course includes literature work.

Target group:

-

Prerequisites and co-requisites:

-

Recommended optional programme components:

Introduction to Materials Science

Recommended or required reading:

Lecture notes; R. Pierce: Sheet Metal Forming, 1991.

Assessment methods and criteria:

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

Grading:

Numerical grading scale 1-5.

Person responsible:

Jari Larkiola

Working life cooperation:

-

Other information:

-

463058A: Foundry Technology, 3,5 op

Voimassaolo: - 31.07.2021
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Valtonen, Markku Kullervo
Opintokohteen kielet: Finnish
Leikkaavuudet:

   463105A   Casting techniques   8.0 op

ECTS Credits:

3,5 ects

Language of instruction:

Finnish

Timing:

Lectures, during the period 2. and exercises during the periods 2.-3.

Learning outcomes:

The aim of the course is to give the students basic information concerning founding processes and how those are suited to different kinds of production and also what those methods require for product constructions.

Learning outcomes: After completing the course, the student can estimate which kinds of products are possible and are profitable to make by casting. The student can analyze the possibilities and limits of founding technology in parts design. The student can tell the main principles of common founding methods and how those methods are suited to different kinds of products and various sizes. The student can also explain the main principles of the process plan and founding system design.

Contents:

Different pattern and mould types; Mould making methods; Casting methods; Mechanization of foundry; Smelting technology; Casting metals; Post treating of cast part; Part design of product; Design of founding system

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

The course is based on lectures, design exercises and laboratory exercises in the autumn of the third year. The lectures follow a regular weekly schedule in the second period, and the schedule for the exercises in second and third period are given later. The grade of the course is based on an examination and exercises.

Target group:

-

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Materials are given by the teacher.

Assessment methods and criteria:

Final exam and practical work.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 1-5.

Person responsible:

Markku Valtonen

Working life cooperation:

-

Other information:

-

464052A: CAD, 3,5 op

Voimassaolo: 01.08.2005 - 31.07.2021
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Tapio Korpela
Opintokohteen kielet: Finnish
Leikkaavuudet:

464101A   Machine drawing and CAD   5.0 op

ECTS Credits:

3,5 ects

Language of instruction:

Finnish

Timing:

Excercises during periods 4 -5 and practical work, period 6

Learning outcomes:

The objective of the course is for students to learn how to use the computer system for modeling and drafting machine parts and assemblies.
Learning outcomes: After the course, the student is able to model the parts and assemblies which he/she has designed by using the CAD/CAM system used in this course. A student is able to make detail drawings and assembly drawings by using the CAD/CAM system used in this course.

Contents:

The course is started with a lecture, which is an introduction to the parametric feature based modeling of machine parts. A 3D model and a detail drawing of a prismatic part, which is able to machine in a milling machining is introduced. A 3D model and a detail drawing of a rotational part, which is able to machine in a lathe is also introduced. An assembly drawing from the given parts is part of this course..

Mode of delivery:

Lectures and exercises

Learning activities and teaching methods:

The course is started with a lecture, which is an introduction to the parametric feature based modeling of machine parts. There will be guided modeling and drafting exercises in a computer class room and a personal exercise work.

Target group:

 -

Prerequisites and co-requisites:

 -

Recommended optional programme components:

The machine drawing course

Recommended or required reading:

The manuals of the CAD/CAM system will be used in the course.

Assessment methods and criteria:

Personal exercise, grading 1 -5
Read more about assessment criteria at the University of Oulu webpage.

Grading:

 Numerical 1 - 5

Person responsible:

Tapio Korpela

Working life cooperation:

 No

Other information:

 -

464087A: Maintenancy Technology, 5 op

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

462103A	Introduction to Maintenance	5.0 op
462107A	Maintenance of machines	5.0 op

ECTS Credits:

5 ects

Language of instruction:

Finnish

Timing:

The course consists of lectures and exercises arranged during the 6th period.

Learning outcomes:

The objective of the course is to provide an overview of targets and lines of action in the maintenance of industrial plants. In addition, the student is introduced to machine diagnostics and reliability technology. Learning outcomes: After the course, the student is able to talk about the significance and targets of the maintenance of industrial plants and use the most important terms or concepts related to maintenance and reliability. He/she will recognize the elements affecting the life-cycle costs of products or the overall effectiveness of production lines. The student also knows how to use different reliability technology models and can introduce the most common maintenance strategies and organizing methods. After the course, the student is capable of explaining the significance of machine diagnostics in maintenance and indicating the main diagnosis tools. He/she is able to identify the most typical machine faults by means of overall level and time domain measurements and frequency spectra. The student is also able to evaluate machine vibration severity and carry out single and two-plane balancing. In addition, he/she knows how to take into consideration the requirements that maintenance places on the machine design.

Contents:

The general part of the course discusses the basics of reliability technology, maintenance management and economics, and the issue of taking maintenance into consideration in machine design. The content of the diagnostics section of the course is: 1. Overall level measurements and evaluation of vibration severity; 2. Time and frequency domain analysis; 3. Dynamic balancing.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

The course consists of lectures and exercises arranged during the 6th period. The grade of the course is based on a final examination. The student must pass the exercises before taking the examination.

Target group:

-

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Lahdelma, S., Lecture notes: Diagnosis of machine condition, 2008. (In Finnish); Järviö, J., et al., Kunnossapito. Helsinki, KP-Media Oy / Kunnossapitoyhdistys ry 2007. (In Finnish); Lectures and other material will be distributed during the course. English course material is also available. Supplementary readings: Järviö, J., Luotettavuuskeskeinen kunnossapito. Rajamäki, KP-Tieto Oy / Kunnossapitoyhdistys ry 2000. (In Finnish); Käynnissäpidon johtaminen ja talous. Loviisa, SCEMM 1996. Available also in English: Keep It Running - Industrial Asset Management. Loviisa, SCEMM 1998.

Assessment methods and criteria:

The grade of the course is based on a final examination. The student must pass the exercises before taking the examination.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 1-5.

Person responsible:

Prof. Sulo Lahdelma

Working life cooperation:

-

Other information:

-

A440123: Module Preparing for the Option, Civil Engineering (obligatory studies), 22,5 - 24 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 Studies of Civil Engineering

461016A: Statics, 5 op

Voimassaolo: - 31.07.2021
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Lahtinen, Hannu Tapio
Opintokohteen kielet: Finnish
Leikkaavuudet:

ay461102A   Statics (OPEN UNI)   5.0 op
461102A   Statics   5.0 op

ECTS Credits:

5 ects cr

Language of instruction:

Finnish

Timing:

Lectures and exercises, periods 1-3

Learning outcomes:

The aim of this course is to give an understanding of the static equilibrium of structures and skills to balance force systems. This course also prepares students for later studies.
Learning outcomes: After the course, the student can calculate forces and moments of loaded structures using equations of vector algebra and trigonometry. He/she can draw a free body diagram of the force system and then solve the unknown forces by using equations of equilibrium. He/she can determine resultants from uniformly distributed loads and apply Coulomb's law of friction in the problem equilibrium. The student can solve problems of internal and external forces of particle systems and rigid body systems in case of static equilibrium. Especially, he/she can draw shear force and bending moment diagrams for beam structures.

Contents:

Fundamental laws and concepts in statics; Force systems and their treatment; Equilibrium of particles and rigid bodies; Static forces in isostatic structures such as beams, frames, cables and trusses; Friction; The principle of virtual work for rigid bodies; Stability of equilibrium.

Mode of delivery:

Face-to-face -teaching.

Learning activities and teaching methods:

Lectures and exercises take place at autumn periods 1-3. Four mid-term exams or one final exam required.

Target group:

-

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Salmi, T.: Statiikka, Pressus Oy, Tampere 2005; Beer, F., Johnston, R.: Vector Mechanics for Engineers, Statics, McGraw-Hill Book Company, 1990; Meriam, J.: Statics, SI version, 2 ed., New York, London, 1975.

Assessment methods and criteria:

Four mid-term exams or one final exam required.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

numerical 1-5/fail

Person responsible:

Hannu Lahtinen

Working life cooperation:

No

Other information:

-

461010A: Strength of Materials I, 7 op

Voimassaolo: - 31.07.2021
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Lahtinen, Hannu Tapio
Opintokohteen kielet: Finnish
Leikkaavuudet:

   461103A   Strength of materials I   5.0 op

ECTS Credits:

7 ects

Language of instruction:

Finnish

Timing:

Lectures and exercises take place during the spring periods 4 - 6.

Learning outcomes:

The aim of this course is to give fundamental concepts in the field of strength of materials and provide a capability to dimension such basic structures as tension and compression bars, torsion bars and and beams.
Learning outcomes: After the course, the student can determine stresses and strains of structures under loading. He/she can change the general stress and strain states from one coordinate system to another and can also apply constitutive equations in calculations. The student can dimension typical structures such as tension and compression bars, torsion bars, straight beams and buckling struts.

Contents:

Purpose and goals of strength of materials; Experimental elastic properties and strength of steel; Tension and compression of straight bars; Round torsion bar under shear force and torsion loads; Stresses and

deflection curves in straight beams under bending moments; Elastic buckling; Stress state, strain state and constitutive equations, principal stresses, Mohr's circle; Stress hypotheses.

Mode of delivery:

Face-to-face

Learning activities and teaching methods:

Lectures and exercises take place during the spring periods 4 - 6. Four midterm exams or one final exam is required.

Target group:

-

Prerequisites and co-requisites:

-

Recommended optional programme components:

Statics

Recommended or required reading:

Outinen, H., J., Salmi, T.: Lujuusopin perusteet, Pressus Oy, Tampere, 2004, Pennala, E.: Lujuusopin perusteet, Moniste 407, Otatieto 2002; Karhunen, J. & al.: Lujuusoppi, Otatieto 2004; Ylinen, A.: Kimmo- ja lujuusoppi I ja II, WSOY. 1976. Beer, F., Johnston, E., Mechanics of materials , McGraw-Hill, 1992

Assessment methods and criteria:

Midterm exams or one final exam is required.
The final grade is based on the combined points from exercises and exams.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 1-5.

Person responsible:

Hannu Lahtinen

Working life cooperation:

-

Other information:

-

460118A: Building Materials, 3 op

Voimassaolo: 01.08.2007 - 31.07.2021

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Mikko Malaska

Opintokohteen kielet: Finnish

Leikkaavuudet:

   ay460118A   Building Materials (OPEN UNI)   3.0 op

ECTS Credits:

3 cr

Language of instruction:

Finnish

Timing:

Lectures and exercises during periods 4.-6.

Learning outcomes:

Objective: The aim of the course is to familiarize students with the properties and sustainability of the most common construction and building materials and to introduce the legislation relating to quality assurance, standardization, certification and sustainability.

Learning outcomes: After completing the course students can describe the material properties of the most common construction materials. Students can also describe how laws and legislation affects the production, certification and the use of materials.

Contents:

The following topics are covered during the course: The raw materials, production and properties of the most common construction materials. Quality assurance and certification of building products. Health and environmental regulations.

Learning outcomes: After completing the course students can describe the material properties of the most common construction materials. Students can also describe how laws and legislation affects the production, certification and the use of materials

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures and exercises

Target group:

-

Prerequisites and co-requisites:

-

Recommended optional programme components:

460116A Introduction to building construction

Recommended or required reading:

The students will be informed about the practical arrangements at the beginning of the course.

Assessment methods and criteria:

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

Grading:

1-5

Person responsible:

Mikko Malaska

Working life cooperation:

-

Other information:

-

460117A: Introduction to Structural Design, 6 op

Voimassaolo: 01.08.2007 - 31.07.2021
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Liedes, Hannu Tapani
Opintokohteen kielet: Finnish
Leikkaavuudet:

485102A	Introduction to structural design	5.0 op
466102A	Introduction to structural design	3.0 op

ECTS Credits:

6 ects cr

Language of instruction:

Finnish

Timing:

Lectures and exercises during periods 1.-3.

Learning outcomes:

This course provides a general introduction to the structural design process. This course include limit states design philosophy, estimation of dead, live, snow, and wind load effects according to Eurocodes and load paths.
This course will develop the student's ability to estimate actions and solve common effects of actions.

Contents:

The construction legislation. The regulations of Local building officials. Eurocodes and National annex.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures and exercises

Target group:

-

Prerequisites and co-requisites:

460116A Introduction to Building Construction

Recommended optional programme components:

460116A Introduction to Building Construction

Recommended or required reading:

Lecture notes

Assessment methods and criteria:

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

Grading:

1-5

Person responsible:

Hannu Liedes

Working life cooperation:

-

Other information:

-

460116A: Introduction to Building Construction, 3 op

Voimassaolo: 01.08.2007 - 31.07.2021

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Liedes, Hannu Tapani

Opintokohteen kielet: Finnish

Leikkaavuudet:

485101A	Introduction to building construction	5.0 op
466101A	Introduction to building construction	5.0 op
ay460116A	Introduction to Building Construction (OPEN UNI)	3.0 op

ECTS Credits:

3 ects cr

Language of instruction:

Finnish

Timing:

Lectures and exercises during periods 1.-3.

Learning outcomes:

The main objective of this course is to present the foundational facts, definitions, and concepts of building construction to beginning students to prepare them for their coming courses.
At the end of the course, it is expected that students will have a good understanding of the construction legislation and principle of construction planning. Students are able to find information in building construction.

Contents:

The construction legislation. The regulations of Local building officials. Building Construction Information Sources

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Final examination and exercises acceppted.

Target group:

-

Prerequisites and co-requisites:

No

Recommended optional programme components:

No

Recommended or required reading:

The students will be informed about the practical arrangements at the beginning of the course.

Assessment methods and criteria:

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

Grading:

Numerical grading scale 1-5.

Person responsible:

Hannu Liedes

Working life cooperation:

-

Other information:

-

A440124: Module Preparing for the Option, Civil Engineering (optional studies), 16 - 17,5 op

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

Ei opintojaksokuvauksia.

Electives

463052A: Introduction to Manufacturing Technology, 5 op

Voimassaolo: - 31.07.2021

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

463101A   Introduction to manufacturing technology   5.0 op

ECTS Credits:

5 ects

Language of instruction:

Finnish

Timing:

Spring, lectures 10 h, period 4, exercises periods 4 -5

Learning outcomes:

The aim of this course is to give students a general view of manufacturing methods. The primary emphasis of the course is on the cutting methods of metals.
Learning Outcomes: Upon completion of the course, the student is able to name the central areas of manufacturing technology and the most important cutting methods. In addition, the student is able to choose the applicable cutting methods and tools for achieving the basic manufacturing tolerances. The student is able to explain the basic features of the most usual materials of cutting tools.

Contents:

The course includes 10 hours lectures, an examination and the practical exercises of metal cutting in the laboratory.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

In the spring, 10 hours of lectures and exercises will be held during periods 4 and 5. The exam and exercises will be graded 0-5. The final grade is based on the combined points from exercises and the final exam.

Target group:

-

Prerequisites and co-requisites:

No

Recommended optional programme components:

 -

Recommended or required reading:

Copies of lecture material, other material to be notified at the start of lectures.
Ihalainen, E., Aaltonen, K., Aromäki, M., Sihvonen, P.: Valmistustekniikka. Otatieto Oy: Helsinki, 2007, 490 p.

Assessment methods and criteria:

Exam and exercises are graded 1-5. Half of the final grade is based on the grade of the exercises and another half of the final grade is based on the grade of the exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 1-5

Person responsible:

Martti Juuso

Working life cooperation:

No

Other information:

-

460165A: Introduction to Construction Economics I, 3 op

Voimassaolo: 01.08.2007 - 31.07.2018

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Timo Aho

Opintokohteen kielet: Finnish

Leikkaavuudet:

466113S   Construction economics   5.0 op

ECTS Credits:

3 ects cr

Language of instruction:

Finnish

Timing:

Lectures during periods 3.-4.

Learning outcomes:

A student can explain the position of the construction sector in the national economy, the contents of a construction project in life time approach as well as production scheduling fundaments and project management activities. A student can use cost data banks and calculate a cost assessment and an offer of minor construction project. He and she know investment calculation methods and viability factors. Furthermore, students can plan general scheduling of a project, action area plan and building stage schedule.

Contents:

Economic effects of construction sector in economy. Administratiove stuctures in society. Public procurements. Cost control and life cycle chains in building. Life cycle costing. Building and building contracts.   Project administration principles, Critical path methods and arrow diagrams and CPM networks. Time tables. Pre tender price estimating. Price estimating. Energy consumption estimating in buildings. Ecology in construction. Construction management operations.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures, exercises and practical work.

Target group:

-

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

The students will be informed about the practical arrangements at the beginning of the course.

Assessment methods and criteria:

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

Grading:

Numerical grading scale 1-5.

Person responsible:

Timo Aho

Working life cooperation:

-

Other information:

-

461011A: Strength of Materials II, 7 op

Voimassaolo: - 31.07.2021

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Laukkanen, Jari Jussi

Opintokohteen kielet: Finnish

Leikkaavuudet:

461104A   Strength of materials II   5.0 op

ECTS Credits:

7 ects

Language of instruction:

Finnish

Timing:

Lectures and exercises take place during the periods 1. -3.

Learning outcomes:

The aim of this course is to provide students with a general view of the different areas concerning the strength of materials.
Learning outcomes **:** Upon completion of the course, the student should be able to use the basic methods of fatigue strength estimation and fracture mechanics to estimate the life of simple structures. He/she is also able to solve the problem concerning the buckling of columns and beam columns. Moreover,the student is able to solve the problem of the bending of curved beams and free and warping torsion of beams. After this course the student will have the basic skills to form linear visco-elasticity models.

Contents:

Basic methods of fatigue strength estimation; Basics of fracture mechanics; Buckling of columns and beam columns; Bending of curved beams; Free and warping torsion; Linear visco-elasticity

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

This course will be based on lectures and exercises during periods 1 - 3 and will have a final exam or mid-term exams.

Target group:

 -

Prerequisites and co-requisites:

 -

Recommended optional programme components:

Statics and Strength of Materials I

Recommended or required reading:

Pennala, E.: Lujuusopin perusteet, Moniste 407, Otatieto, 1998; Outinen, H., Koski, J., Salmi, T.: Lujuusopin perusteet, Pressus Oy: Tampere, 2000; Salmi, T., Virtanen, S.: Materiaalien makaniikka, Pressus Oy: Tampere, 2008; Ylinen, A.:Kimmo- ja lujuusoppi I ja II. WSOY, 1976; Bära brista, grundkurs i hållfasthetslära, AWE/Gebers: Stockholm, 1979.

Assessment methods and criteria:

Midterm exams or one final exam is required.
After the passed exercises a student is allowed to take part in an exam.

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

Grading:

Numerical grading scale 1-5.

Person responsible:

Jari Laukkanen

Working life cooperation:

 -

Other information:

 -

461033A: Finite Element Methods I, 3,5 op

Voimassaolo: 01.08.2007 - 31.07.2021

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Lumijärvi, Jouko Veikko Juhani

Opintokohteen kielet: Finnish

Leikkaavuudet:

461107A	Finite Element Methods I	5.0 op
461014S	Finite Element Methods	5.0 op

ECTS Credits:

3,5 ects

Language of instruction:

Finnish

Timing:

Lectures and exercises, periods 1. - 2.

Learning outcomes:

The aim of this course is for students to gain an understanding of the
basic idea and restrictions of FEM and the preparedness to the use of commercial FE-programs.
Learning outcomes: After this course, the student can explain the basic idea of the FEM. He/she can
analyze simple truss- and frame structures and explain the theoretical background of the calculations. In
addition, the student can analyze two-dimensional and heat transfer problems by using FEM.

Contents:

The basic idea of FEM and its use in static analyses of bars, beams and plane structures. Some general
principles of the use of FEM.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures and exercises take place during periods 1 and 2. The course can be passed either by completing
two mid-term exams or a final exam

Target group:

-

Prerequisites and co-requisites:

-

Recommended optional programme components:

Strength of Materials I and II.

Recommended or required reading:

Lecture notes (in Finnish), N. Ottosen & H. Petersson: Introduction to the Finite Element Method, NAFEMS: A Finite Element Primer, O. C. Zienkiewcz & R. L. Taylor: The Finite Element Method, 4th ed, Vol. 1: Basic Formulation and Linear Problems.

Assessment methods and criteria:

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

Grading:

Numerical grading scale 1-5.

Person responsible:

 Jouko Lumijärvi

Working life cooperation:

 -

Other information:

 -

460125A: Introduction to Design of Steel Structures, 4 op

Voimassaolo: - 31.07.2021

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Kangaspuoskari, Matti Johannes

Opintokohteen kielet: Finnish

Leikkaavuudet:

   466105S   Design of Steel Structures   6.0 op

Language of instruction:

Finnish

Timing:

Lectures and exercises during periods 1.-3.

Learning outcomes:

Objective: The aim of the course is to familiarize students with the material properties of steel and to introduce the performance and structural design principles of the most typical steel structures.
 Learning outcomes: After completing the course the student is capable of explaining the crystalline structure of steel material and he understands elasto-plastic material model. He is able to explain the effect of inclusions, heat treatment and welding process to the mechanical properties of a steel material. The student is familiar with fire design of steel structures. He is able to explain common types of corrosion. The student is able to design the most typical joints in a steel frame and he can analyze simple steel structures.

Contents:

The following topics are covered during the course: Ferrous metals and their properties. Principles of Eurocodes. Design of simple steel structure under base loading cases and loading combinations. Corrosion. Design of joints in steel structures. Composite structures with steel member.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures and exercises take place during periods 1 - 3. Two midterm exams or one final exam is required. One design exercise is required.

Target group:

-

Prerequisites and co-requisites:

460117A Introduction to Structural Design

Recommended optional programme components:

460117A Introduction to Structural Design. Key notes in courses Statics, Strength of Materials I, Strength of Materials II, Energy principles and Their Use in Beam Structures, and Plates and Shells.

Recommended or required reading:

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

Assessment methods and criteria:

Two midterm exams or one final exam is required. One design exercise is required.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

1-5

Person responsible:

Matti Kangaspuoskari

Working life cooperation:

-

Other information:

-

460135A: Introduction to Structural Timber Design, 4 op

Voimassaolo: - 31.07.2021
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Pirkola, Heikki Juhani
Opintokohteen kielet: Finnish

ECTS Credits:

4 ects cr

Language of instruction:

Finnish

Timing:

Lectures and exercises during periods 4.-6.

Learning outcomes:

The student can explain main features of wood as building material and can design ordinary wood constructions. The student can tell how the wood act in fire situation and how to isolate constructions from fire.

Contents:

Properties of wood and wood products. Single family house design: beams, columns, walls, trusses. Stiffening and fire protection of wood constructions.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures and exercises

Target group:

-

Prerequisites and co-requisites:

460116A Introduction of building construction, 460117A Introduction of building design, 460118A Building materials

Recommended optional programme components:

460116A Introduction of building construction, 460117A Introduction of building design, 460118A Building materials

Recommended or required reading:

The students will be informed about the practical arrangements at the beginning of the course.

Assessment methods and criteria:

Final exam and exercises.The final grade is based on the combined points from the exam (grade 0.5) and exercises (grade 0.5).
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 1-5.

Person responsible:

Heikki Pirkola

Working life cooperation:

-

Other information:

-

460147A: Introduction to Design of Concrete Technology, 4 op

Voimassaolo: 01.08.2011 - 31.07.2021

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Hannila, Raimo Sakari

Opintokohteen kielet: Finnish

Leikkaavuudet:

485106A	Design of concrete structures	5.0 op
466107S	Design of concrete structures	6.0 op

ECTS Credits:

4 ects cr

Language of instruction:

Finnish

Timing:

Lectures and exercises during periods 1.-3.

Learning outcomes:

Objective: The student knows the basics of the design of concrete structures by the requirements of the " level A" according to the Finnish Construction Legislation.

Learning Outcomes: The student is able to design and dimension basic reinforced concrete structures loaded by flexural or compressive loadings according to the requirements of the EN standards.

Contents:

The deformation and strength characteristics of concrete and reinforcing steel bars as well as time-dependent features. Design of service life. The anchorings and the joints of the reinforcing steel bars. Service and ultimate limit state design of reinforced concrete beams and columns.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Theory lectures and practical training lessons are given in combination. Project work should be done acceptably.

Target group:

-

Prerequisites and co-requisites:

-

Recommended optional programme components:

Prerequisite: knowledge in statics, strength of materials, basics of structural mechanics. Concrete technology. Structural design.

Recommended or required reading:

Lecture notes. Leskelä: By210 Betonirakenteiden suunnittelu ja mitoitus 2008. By60 Suunnitteluohje EC2 osat1-1 ja 1-2, 2008. SFS-EN 1992-1-1 (and the other appopriate EN-standards). By202 Betonitekniikan oppi-kirja 2004. By47 Betonirakentamisen laatuohjeet 2007.

Assessment methods and criteria:

The grade is determined according to the midterm exams or the final exam.
Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

Numerical grading scale 1-5.

Person responsible:

University Teacher Raimo Hannila

Working life cooperation:

-

Other information:

-

460145A: Concrete Structures, 6 op

Voimassaolo: 01.08.2005 - 31.07.2011
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Hannila, Raimo Sakari
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

A440135: Module Preparing for the Option, Process and Environmental Engineering (obligatory studies), 20 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 Studies of Process and Environmental Engineering

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.

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.

A440136: Module Preparing for the Option/Process and Environmental Engineering (optional studies), Process Engineering (optional studies), 20 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Module Preparing for the Option

Laji: Study module

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Optional Studies of Process Engineering

477301A: Momentum Transfer, 3 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Tuomaala, Eero Juhani, Ainassaari, Kaisu Maritta

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.

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:

-

477501A: Process Control Engineering I, 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:

-

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:

-

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:

-

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:

-

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.

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:

-

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:

-

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:

-

A440138: Module Preparing for the Option/Process and Environmental Engineering (optional studies), Environmental Engineering (optional studies), 20 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Module Preparing for the Option

Laji: Study module

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Optional Studies of Environmental Engineering

477301A: Momentum Transfer, 3 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Tuomaala, Eero Juhani, Ainassaari, Kaisu Maritta

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:

-

477501A: Process Control Engineering I, 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:

-

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:

-

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.

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:

-

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:

-

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:

-

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:

-

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.

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:

-

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:

-

A440139: Module Preparing for the Option/Electrical and Information Engineering, 20 op

Voimassaolo: 01.08.2013 -
Opiskelumuoto: Module Preparing for the Option
Laji: Study module
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Compulsory

521109A: Electrical Measurement Principles, 5 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Electrical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Juha Saarela
Opintokohteen kielet: Finnish

ECTS Credits:

5

Language of instruction:

Lectures are in Finnish. Laboratory exercises and exams can be done in English.

Timing:

Periods 1-3.

Learning outcomes:

Upon completion of the course, students are be able to measure basic measurements with a ammeter, voltmeter and oscilloscope. They can operate signal and function generators. They can estimate the validity of their measurements.

Contents:

Units of measures, standards of measures, analysis of errors, most commonly used analog and digital measuring methods, equipment and safety regulations.

Mode of delivery:

Pure face-to-face teaching.

Learning activities and teaching methods:

Lectures 20h and laboratory exercises 16 h, independent work 100 h.

Target group:

Course is compulsory for electrical engineering, information engineering and wellness technology students.

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Ask the person responsible for English material. (Lectures are based on some chapters of book: W.D. Cooper: Modern Electronic Instrumentation and Measurement Techniques, Prentice Hall, 1990. English labwork material is available.

Assessment methods and criteria:

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

Grading:

Grade is based on exam and grade is on numerical scale 1-5.

Person responsible:

Juha Saarela

Working life cooperation:

-

Other information:

-

521142A: Embedded Systems Programming, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Computer Science and Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Riekki, Jukka Pekka

Opintokohteen kielet: Finnish

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5

Language of instruction:

Finnish, the course can be completed in English by answering the lecture questions and by doing the laboratory exercise, the programming exercises and the final exercise.

Timing:

Spring, periods 4-6.

Learning outcomes:

Upon completing the required coursework, the student is able to implement small C programs both in Unix environment and for embedded systems with memory-mapped I/O. Moreover, the student is able to recognize how embedded systems programming differs from programming general-purpose computers.

Contents:

Basics of C, bitwise operations, memory management, memory-mapped I/O devices, hardware registers, interrupts, compiling and linking.

Mode of delivery:

Web-based teaching + face-to-face teaching

Learning activities and teaching methods:

20 h lectures, 3 h laboratory exercise; 10-20 h voluntary guided practising, the rest as independent work alone and in the two-person groups.

Target group:

1st year students of computer science and engineering and electrical engineering and other Students of the University of Oulu.

Prerequisites and co-requisites:

The following courses must be completed prior to applying for the course: 521141P Elementary programming.

Recommended optional programme components:

The course "521267A Computer Engineering" is recommended to be completed simultaneously.

Recommended or required reading:

Will be announced at the beginning of the course.

Assessment methods and criteria:

Students answer questions after each lecture, participate the laboratory exercise, and do the programming exercises and the final exercise. Assessment is based on these three elements; passing the course requires points from each element. More detailed information on assessment can be found from http://www.oulu.fi/cse/studying/courses.
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:

Jukka Riekki

Working life cooperation:

-

521267A: Computer Engineering, 4 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Computer Science and Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Juha Röning
Opintokohteen kielet: Finnish
Leikkaavuudet:

   810122P   Computer Architecture   5.0 op

ECTS Credits:

4

Language of instruction:

Finnish.

Timing:

The course unit is held in the spring semester, during periods 4 - 6. It is recommended to complete the course at the beginning of studies.

Learning outcomes:

The aim of the course is to provide basic understanding to the operation of a digital computer, and to provide basic knowledge for programming using a symbolic programming language. After passing the course, student can explain the basic operation principle of a computer, the phases of an instruction

execution, and an interrupt mechanism. The student can explain the basic organization of a computer including CPU, ALU, memory, I/O device, bus, and a register. The student can describe some basic operations of a computer using a register transfer language, and explain the role of instruction format as a part of the control logic. The student can perform conversions between number systems such as decimal, binary and hexadecimal systems. The student can use and interpret the basic data representations used in a digital computer such as integers, fixed point numbers, floating point numbers, and ASCII symbols. The student can explain the arithmetic operations performed using two's complement, the basic principles of a RISC architecture, and the connection of these principles to the performance of the computer. The student can explain a typical memory organization and terms like address space, cache memory, and virtual memory. The student can explain the principles of asynchronous communication, and the operation of the assembler. The student can create small programs using an assembly language.

Contents:

Computer organization and architecture, the operation principle of a computer, register transfer language, data types, interrupt, I/O devices, and memory organization. Assembly language and the operation of an assembler.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 30h, exercises 18h, programming exercise 8h, and exam. The rest of the self-study.

Target group:

Computer Science and Engineering students and other Students of the University of Oulu.

Prerequisites and co-requisites:

Student must have completed the following courses are completed prior to applying for the course: 521412A Digital Techniques I.

Recommended optional programme components:

-

Recommended or required reading:

Mano M., Computer System Architecture. Prentice Hall, Eng-lewood Cliffs, New Jersey 1993.

Patterson D., Hennessy J., Computer Organization and Design. Morgan Kauffman, San Fracisco, CA, 2005.

Assessment methods and criteria:

Exam and programming 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:

Juha Röning, Teemu Tokola

Working life cooperation:

-

521412A: Digital Techniques 1, 6 op

Voimassaolo: 01.08.2011 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Electrical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Antti Mäntyniemi
Opintokohteen kielet: Finnish
Leikkaavuudet:

   521301A   Digital Techniques 1   8.0 op

ECTS Credits:

6

Language of instruction:

In Finnish.

Timing:

Period 1-3

Learning outcomes:

Learning outcomes: After the course, students are able to ably binary number system and Boolean algebra in the form of switching algebra to the design and functional analyze of simple digital circuits. In addition, they are also able to use in their designs graphical symbols specified in the dependency notation standard (SFS4612 ja IEEE/ANSI Std.91-1991) and different descriptions of function and structure of state machines. Based on this knowledge, students are able to implement and analyze digital devices consisting of ordinary simple digital components, especially FPGA circuits. After having assimilated the basic knowledge of digital technique, students are able to understand also the function and structure of micro controllers and micro processors.

Contents:

Principles of digital devices, Boolean algebra, number notations, analyze and synthesis of combinatorial circuits, flip-flops, principles of state machine behavior, CPLD- and FPGA-circuits, physical characteristics of CMOS technology.

Mode of delivery:

Classroom

Learning activities and teaching methods:

Lectures 40h/ exercises 20h (group exercises)

Target group:

1st year students.

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Brown, S., Vranesic, Z. Fundamentals of Digital Logic with VHDL Design, McGraw Hill, 2005, materials in Optima.

Assessment methods and criteria:

Compulsory exercises and exam. Recommended by partial exams.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Exercises: pass/fail. Final grading for the exam 1 – 5.

Person responsible:

Antti Mäntyniemi

Working life cooperation:

-

Other information:

-

A440129: Module Preparing for the Option, Electrical Engineering (optional studies), 16 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Module Preparing for the Option

Laji: Study module

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Electives

031018P: Complex Analysis, 4 op

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

031077P   Complex analysis   5.0 op

ECTS Credits:

4

Language of instruction:

Finnish

Timing:

Fall semester, periods 1-2

Learning outcomes:

After completing the course the student is able to calculate the derivative and integral of complex function, is able to calculate contour integrals, understands Cauchy's integral theorem and its consequences, is able to form the series representation of analytic function and use the Residue theory for computing line integrals. Furthermore the student is able to apply complex analysis analysis techniques to simple problems in signal processing.

Contents:

Complex numbers and functions, complex derivative and analyticity, complex series, Cauchy's integral theorem and its consequences, Laurent and Taylor expansions, Residue, the argument principle, Möbiius transformation, applications to signal analysis

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:

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

Recommended optional programme components:

Prerequisite to signal Analysis.

Recommended or required reading:

 E.B. Saff and A.D. Saddler, Fundamentals of Complex Analysis with applications to engineering and science.

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:

Keijo Ruotsalainen

Working life cooperation:

-

Other information:

-

031050A: Signal Analysis, 4 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Mathematics Division

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

   031080A   Signal Analysis   5.0 op

ECTS Credits:

4

Language of instruction:

Finnish

Timing:

3-4

Learning outcomes:

After the course the student is able to calculate the energy, the power, the convolution and the frequency spectrum of discrete and analog, periodic and non-periodic deterministic signals. The student is able to study the stationarity, the ergodicity, the mutual dependence and the frequency content of random signals by means of the auto- and cross-correlation functions, the covariance function and the power- and cross-power spectral densities. The student is able to explain the mathematical grounds of the most central optimal systems used in signal estimation, and can solve related problems.

Contents:

Signals, classification, frequency. Orthogonal expansions. Fourier analysis, analog and digital signal, fast Fourier transform. Random variable. Random signal. Stationarity, ergodicity, autocorrelation. Power spectral density. Autoregressive, Gaussian and Poisson processes. Signal estimation, orthogonality principle, Yule-Walker equations, Wiener filter. Matched filter.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 40 h /Group work 20 h. Homework assignments.

Target group:

-

Prerequisites and co-requisites:

The recommended prerequisite is the completion of the courses 031019P Matrix Algebra, 031021P Probability and Mathematical Statistics, 031018P Complex Analysis.

Recommended optional programme components:

-

Recommended or required reading:

Lecture notes. Proakis, J.G., Manolakis, D.K.: Introduction to Digital Signal Pro-cessing. Shanmugan, K.S., Breipohl, A.M.: Random Signals, Detection, Estimation and Data Analysis.

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:

Vesa Kotila, Pasi Ruotsalainen

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:

-

031023P: Mathematical Structures for Computer Science, 5 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Mathematics Division

Arvostelu: 1 - 5, pass, fail

Opettajat: Matti Peltola

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay031023P   Mathematical Structures for Computer Science (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 is able to apply result of logic to find the truth value of logical statement. He can express sentences of natural language by symbols of logic. He can use arithmetic operations on different number bases. The student is able to apply formal methods of discrete mathematics to model simple information processing problems.

Contents:

Elementary logic. Mathematical induction. Boolean algebra and set theory. Theory of automata and formal languages. Some graph theory.

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:

Rosen K.H.: Discrete Mathematics and Its Applications. Gersting J.L.: Mathematical Structures for Computer Science.

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:

-

521104P: Introduction to Material Physics, 5 op

Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Department of Electrical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Juha Hagberg
Opintokohteen kielet: Finnish

ECTS Credits:

5

Language of instruction:

In Finnish.

Timing:

Periods 1-3.

Learning outcomes:

After completing the course, student is able to explain the basic concepts related to materials physics. The student can outline the crystal structure of the solids and the crystalline binding and is able to explain the principles of the theory used in describing the different kinds of waves traveling in solids. Moreover, he or she can explain the principles of statistical mechanism and use them to explore thermal properties of the solid. The student can also outline the free electron model of metals and the formation of the energy band structure of the crystals and their significance to the electrical properties of materials. He or she is able to explain the basic phenomena related to semiconductors and is able to calculate the charge carrier distributions in them.

Contents:

Crystal structures and cohesion. Waves and defects in crystals. Basic principles of quantum mechanics and thermal properties (statistics). Free electron model of metals, energy bands and Brillouin zones in crystals. Basic phenomena of semiconductors.

Mode of delivery:

Lectures, exercises and assignments.

Learning activities and teaching methods:

Lectures 30 h, and exercises 30 h, assignments 30 h, independent study 45 h.

Target group:

-

Prerequisites and co-requisites:

Required physics and mathematics courses.

Recommended optional programme components:

The student should take the course 766326A Atomifysiikka at same time or beforehand.

Recommended or required reading:

H.M. Rosenberg: The Solid State, Clarendon Press, Oxford, 1988. B. Streetman: Solid State Electronic Devices, Prentice Hall, New Jersey, 1995.

Assessment methods and criteria:

Grade is based on exams and assignments, grading principles will be defined in the beginning of the course.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numeric grading 1-5.

Person responsible:

Juha Hagberg

Working life cooperation:

-

Other information:

-

521205A: Principles of Semiconductor Devices, 4,5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Electrical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Juha Hagberg

Opintokohteen kielet: Finnish

Leikkaavuudet:

    521071A   Principles of Semiconductor Devices   5.0 op

ECTS Credits:

4,5

Language of instruction:

Finnish / English

Timing:

Periods 4 - 6

Learning outcomes:

Student will be able to explain physical phenomena in semiconductor materials and junctions; describe main types and characteristics of semiconductor diodes and transistors. Student will be able to explain physical principles of operation and to estimate ideal characteristics of the devices.

Contents:

Junctions. Semiconductor diodes and lasers. Bipolar junction transistors. Field effect transistors. Schwitching devices.

Mode of delivery:

Lectures and exercises.

Learning activities and teaching methods:

Lectures 30h/ Exercises 30h/ Self-study 60h.

Target group:

-

Prerequisites and co-requisites:

521104P Introduction to materials physics.

Recommended optional programme components:

-

Recommended or required reading:

Lectures. Book: Streetman, B.: Solid state electronic devices, Prentice-Hall, New Jersey, 2000 (chapters 5 - 8, 11).

Assessment methods and criteria:

Will be notified in the beginning of lectures.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading 1 – 5.

Person responsible:

Juha Hagberg

Working life cooperation:

-

Other information:

-

521209A: Electronics Components and Materials, 2 op

Voimassaolo: 01.08.2011 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Electrical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jari Hannu

Opintokohteen kielet: Finnish

Leikkaavuudet:

   521077P   Introduction to Electronics   5.0 op

ECTS Credits:

2

Language of instruction:

Finnish

Timing:

4-5

Learning outcomes:

Student is able to identify and classify electronics components and compare their properties. Students can describe electric conductivity and apply the phenomenon on designing and choosing resistors. Student is able to estimate the difference between dielectric materials and how they affect the properties of a capacitor. Student can compare properties of magnetic materials and how identify they affect on inductive components. Student can identify semiconductivity and is able to list typical semiconductor components. Student can classify different circuit board techniques and is able to choose proper coupling techniques. In addition student can identify the future technologies of electronics materials

Contents:

Electromagnetic properties of materials (conductivity, dielectricity, magnetism and semiconductivity). Electronics components (resistors, capacitors, inductive components and semiconductors). Interconnection technologies and circuit board technologies. The future of electronic materials and application areas.

Mode of delivery:

Classroom teaching

Learning activities and teaching methods:

Lectures (24 h) and lecture exercises. The course is passed by a final exam or other method presented at the lectures.

Target group:

First year electrical engineering students.

Prerequisites and co-requisites:

None.

Recommended optional programme components:

Electricity and Magnetism

Recommended or required reading:

Lecture material; Materials science and engineering: an introduction / Willam D. Callister, chapters 1, 18 and 20; Electronic components and technology / S. J. Sangwine. Chapters 1,2,3,5 and 7

Assessment methods and criteria:

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

Grading:

1-5

Person responsible:

Jari Hannu

Working life cooperation:

-

Other information:

-

521218A: Introduction to Microfabrication Techniques, 4 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Electrical Engineering

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

521070A   Introduction to Microfabrication Techniques   5.0 op

ECTS Credits:

4

Language of instruction:

In Finnish.

Timing:

Periods 4-6

Learning outcomes:

Upon completing the course the student is able
-         to explain properties of micro- and nanoelectronics and micro- and nanomechanics materials, processing of source materials and basics of fabrication methods
-         utilize the knowledge given by the course in developing applications to be realized by micro- and nanofabrication methods.

Contents:

Lithography. Film growing methods. Dry and wet etching methods. Bulk and surface micromachining. Materials, devices and fabrication methods of integrated circuits. Considerations of modeling, packaging, scaling and power in miniaturized systems. Application examples.

Mode of delivery:

The course will be implemented as face to face teaching.

Learning activities and teaching methods:

24 hours lectures. Demonstrations and design exercises.

Target group:

-

Prerequisites and co-requisites:

The recommended prerequisite is to familiarize with the courses 521104P Introduction to Materials Physics and 521205A Principles of Semiconductor Devices.

Recommended optional programme components:

-

Recommended or required reading:

Lecture notes. Text book will be shown later.

Assessment methods and criteria:

Final exam and passing both design exercise and demonstration.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The final exam utilizes a numerical grading scale 1-5.

Person responsible:

Merja Teirikangas

Working life cooperation:

-

Other information:

-

521302A: Circuit Theory 1, 5 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Electrical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Rahkonen, Timo Erkki
Opintokohteen kielet: Finnish

ECTS Credits:

5

Language of instruction:

Finnish. Exams can be arranged in English on demand.

Timing:

Autumn, periods 1-3

Learning outcomes:

After the course the student can
  • write and solve the equations describing the operation of a given electrical circuit
  • solve the sinusoidal steady-state solution using complex phasor arithmetics
  • solve time responses of electric circuits
  • simplify electrical circuits e.g. using equivalent circuits
  • simulate simple circuits and choose an appropriate circuit simulation method

Contents:

Equation of basic circuit elements, circuit laws and systematic building of network equations. Calculation of time and frequency responses. Use of complex phasor arithmetics. Basics of the use of circuit simulators.

Mode of delivery:

Classroom.

Learning activities and teaching methods:

30h lectures, 22 h exercises, and a simulation exercise (10h)

Target group:

Finnish BSc students.

Prerequisites and co-requisites:

Matrix algebra, complex arithmetics, differential equations.

Recommended optional programme components:

-

Recommended or required reading:

Nilsson, Riedel: Electric Circuits (6th or 7th ed., Prentice-Hall 1996), Chapters 1-11.

Assessment methods and criteria:

Final exam. Also the simulation exercise must be passed.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

1-5

Person responsible:

Prof. Timo Rahkonen

Working life cooperation:

-

Other information:

-

521306A: Circuit Theory 2, 4 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Electrical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Rahkonen, Timo Erkki

Opintokohteen kielet: Finnish

Leikkaavuudet:

521303A   Circuit Theory 2   5.0 op

ECTS Credits:

4

Language of instruction:

Finnish. Exams can be arranged in English on demand.

Timing:

Spring, periods 5-6

Learning outcomes:

After the course the student can
- use Laplace transform for solving time and frequency response of electric circuits
- derive continous-time transfer functions., solve their poles and zeros and understand the meaning of those
- draw the pole-zero map and Bode plots of any given transfer function
- construct 2-port parameter models of a given circuit

Contents:

Use of Laplace transform in network analysis. Properties of network functions, poles and zeros, Boden magnitude and phase plots. 2-port parameter models.

Mode of delivery:

Classroom

Learning activities and teaching methods:

30h lectures, 22 h exercises.

Target group:

Finnish BSc students.

Prerequisites and co-requisites:

Basics of circuit theory, differential equations.

Recommended optional programme components:

-

Recommended or required reading:

Nilsson, Riedel: Electric Circuits (6th or 7th ed., Prentice-Hall 1996), Chapters 12-18.

Assessment methods and criteria:

Course is examined by a final exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

1-5

Person responsible:

Prof. Timo Rahkonen

Working life cooperation:

-

Other information:

-

521431A: Principles of Electronics Design, 5 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Electrical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Juha Häkkinen
Opintokohteen kielet: Finnish

ECTS Credits:

5

Language of instruction:

Finnish.

Timing:

Spring, periods 4-6

Learning outcomes:

On completion of the study module students should be able to analyze and design such electronic building blocks as rectifiers, clamping circuits, amplifiers and CMOS logic elements using diodes, operational amplifiers and MOS and bipolar junction transistors.

Contents:

Analogue and digital circuits, basic amplifier related concepts, operational amplifier, diodes and diode circuits, single stage bipolar and MOS transistor amplifiers, small signal modeling and analyzing ac properties of amplifiers, internal structures of digital circuits (mainly CMOS), MOS/CMOS switch.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 30 h and exercises 20 h.

Target group:

-

Prerequisites and co-requisites:

Circuit Theory I

Recommended optional programme components:

 Recommended course Principles of Semiconductor Devices

Recommended or required reading:

Lecture notes, Razavi: Fundamentals of Microelectronics (John Wiley & Sons 2008), chapters 1-8 and 15 partially or Sedra & Smith : Microelectronic Circuits (6th ed.), chapters 1-5 and 14.

Assessment methods and criteria:

Final or 2 mid-term exams.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 1-5.

Person responsible:

Juha Häkkinen

Working life cooperation:

-

Other information:

-

521432A: Electronics Design I, 5 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Electrical Engineering
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

ECTS Credits:

5

Language of instruction:

Finnish.

Timing:

Autumn, periods 1-3

Learning outcomes:

On completion of the study module students should be able to recount the principles covering the design of multistage amplifiers, analyze and set the frequency response of a transistor amplifier and make use of feedback to improve the properties of an amplifier in the desired manner. They should also be able to analyze the stability of a given degree of feedback amplification and to dimension an amplifier correctly to ensure stability. Students should similarly be able to describe the principles governing the design of power amplifiers, to make widespread use of operational amplifiers for realizing electronic circuits and to take account of the limitations imposed by the non-idealities inherent in operational amplifiers. They should be able to design low-frequency oscillators, to explain the operating principles of radio frequency oscillators and tuned amplifiers and to recount the basic principles governing the functions and properties of emitter-coupled logic.

Contents:

Frequency response of a transistor amplifier, differential amplifier, feedback, stability and nonidealities of a feedback amplifier, comparator, output stages and power amplifiers, applications of operational amplifier, oscillators, tuned amplifiers and ECL logic.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 40 h and exercises 20 h.

Target group:

Not defined.

Prerequisites and co-requisites:

Principles of electronic design

Recommended optional programme components:

This course is required when participating in Laboratory Exercises on Analogue Electronics

Recommended or required reading:

Lecture notes, Razavi: Fundamentals of Microelectronics (John Wiley & Sons 2008), chapters 10-13-8 and 14, partially or Sedra & Smith : Microelectronic Circuits (6th ed.), chapters 7,8,9,13 and partially 11 and 12.

Assessment methods and criteria:

Final or 2 mid-term exams.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 1-5.

Person responsible:

Juha Häkkinen

Working life cooperation:

-

Other information:

-

521337A: Digital Filters, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Computer Science and Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Hannuksela, Jari Samuli

Opintokohteen kielet: Finnish

Leikkaavuudet:

    ay521337A   Digital Filters (OPEN UNI)   5.0 op

ECTS Credits:

5

Language of instruction:

Finnish, English study material available

Timing:

Spring, period 5-6.

Learning outcomes:

Upon completing the required coursework, the student is able to specify and design respective frequency selective FIR and IIR filters using the most common methods. He is also able to solve for the impulse and frequency responses of FIR and IIR filters given as difference equations, transfer functions, or realization diagrams, and can present analyses of the aliasing and imaging effects based on the responses of the filters. Moreover, the student is able to explain the impacts of finite word length in filter design. After the course the student has the necessary basic skills to use signal processing tools available in Matlab environment and to judge the results.

Contents:

1. Sampling theorem, aliasing and imaging, 2. Discrete Fourier transform, 3. Z-transform and frequency response, 4. Correlation and convolution, 5. Digital filter design, 6. FIR filter design and realizations, 7. IIR filter design and realizations, 8. Finite word length effects and analysis, 9. Multi-rate signal processing.

Mode of delivery:

Face-to-face teaching (Lectures), independent work, group work

Learning activities and teaching methods:

Lectures and exercises 50 h. The design exercises familiarize the students with the methods of digital signal processing using the Matlab software package. The rest as independent work.

Target group:

Computer Science and Engineering students and other Students of the University of Oulu.

Prerequisites and co-requisites:

031018P Complex Analysis, 031050A Signal Analysis

Recommended optional programme components:

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

Recommended or required reading:

Lecture notes and exercise materials. Material is in Finnish and in English. Course book: Ifeachor, E., Jervis, B.: Digital Signal Processing, A Practical Approach, Second Edition, Prentice Hall, 2002.

Assessment methods and criteria:

The course can be passed either with week exams or a final exam. In addition, the exercises need to be returned and accepted.
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:

Jari Hannuksela

Working life cooperation:

None.

Compulsory

521337A-01: Digital filters, partial credit, 0 op

Opiskelumuoto: Intermediate Studies
Laji: Partial credit
Vastuuyksikkö: Department of Computer Science and Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Hannuksela, Jari Samuli
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

521337A-02: Digital filters, partial credit, 0 op

Opiskelumuoto: Intermediate Studies
Laji: Partial credit
Vastuuyksikkö: Department of Computer Science and Engineering

Arvostelu: 1 - 5, pass, fail
Opettajat: Hannuksela, Jari Samuli
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

521359A: Telecommunication Engineering 1, 2,5 op

Voimassaolo: - 31.07.2012
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

521361A: Telecommunication Engineering II, 3 op

Voimassaolo: 01.08.1950 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Kari Heikki Antero Kärkkäinen
Opintokohteen kielet: Finnish
Leikkaavuudet:

521330A   Telecommunication Engineering   5.0 op

ECTS Credits:

3

Language of instruction:

Finnish

Timing:

Fall, periods 2-3

Learning outcomes:

After completing the course student can tell and analyze the essential and optional blocks of a digital communication system both in time and in frequency domain. Student also understands limitations resulting from transmission channel and can propose various methods to combat such effects. Using simple assumptions, student can analyze system performance mathematically and compare various modulation methods from the standpoint point of system resources. Student can evaluate standards and specifications of communication systems. Student can also apply obtained knowledge for practical system and sub-system design.

Contents:

Basic blocks of a digital transmission system, baseband digital transmission, binary and M-ary digital continuous-wave modulations, correlation and matched filter receivers and their bit error probability performance with AWGN channel, effects of band-limiting and multipath propagation and methods to combat against such effects, basics of information theory, basics of source coding and error-correction coding methods.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h and exercises 10

Target group:

3 rd year bachelor's degree students

Prerequisites and co-requisites:

Signal Analysis

Recommended optional programme components:

-

Recommended or required reading:

Lecture slides available in Finnish from TTK-OPTIMA system. Slides are based on the coursebook: R.E. Ziemer & W. H. Tranter: Principles of Communications - Systems, Modulation and Noise, 6th edition, 2010, John Wiley & Sons, selected parts of chapters 8, 9, 10, and 11.

Assessment methods and criteria:

The course is passed with a final examination.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5.

Person responsible:

Kari Kärkkäinen

Working life cooperation:

-

Other information:

-

521340S: Communications Networks I, 5 op

Opiskelumuoto: Advanced Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Savo Glisic
Opintokohteen kielet: English

ECTS Credits:

5

Language of instruction:

English

Timing:

Fall, periods 1-3

Learning outcomes:

Upon completing the required coursework, the student is able to list the functionalities of different layers of OSI and TCP/IP protocol models. The course gives the skills for the student to describe the basic structure of GSM, GPRS, EDGE, LTE and IEEE802.11 systems. The student is able to describe the basic protocol model of the UMTS radio interface and radio access network. The student knows the basic properties of routing protocols in ad hoc networks. The student will achieve skills to describe the main principles of mobility control, network security, cross-layer optimization. The course also gives the student the ability to explain the essential features of sensor networks.

Contents:

Communications architecture and protocols, adaptive network and transportation layers, mobility management, network security, network management, ad hoc and sensor networks, cross-layer optimization, examples of wireless communication networks.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 30 h and the compulsory design work with a simulation program (15 h).

Target group:

1 st year M.Sc. and WCE students

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Parts from: S. Glisic & B. Lorenzo: Wireless Networks: 4G Technologies (2nd ed.), 2009; S. Glisic: Advanced Wireless Communications: 4G Cognitive and Cooperative Technologies (2nd ed.), 2007.

Assessment methods and criteria:

The course is passed with a final examination and the accepted simulation work report. The final grade is based on examination.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5.

Person responsible:

Savo Glisic

Working life cooperation:

-

Other information:

Objective: The aim is to present the fundamentals of the structure, protocol and structure of digital data transmission networks. Technical implementation and application of the common data and local networks are also discussed.

521316A: Broadband Communications Systems, 4 op

Voimassaolo: 01.08.2006 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Opettajat: Matti Latva-aho

Opintokohteen kielet: Finnish

Leikkaavuudet:

521329A	Hands-on Course in Wireless Communication	5.0 op
521307A	Laboratory Exercises on Analogue Electronics	5.0 op
521316S	Broadband Communications Systems	5.0 op

ECTS Credits:

4

Language of instruction:

Finnish

Timing:

Spring, periods 4-6

Learning outcomes:

Upon completing the required coursework, student can distinguish the basic transmission technologies used in the most important commercial wireless communication systems. Furthermore, the student can differentiate and compare the key points behind these technologies, why they are used and what are their advantages and disadvantages. Student can explain how the wireless channel impacts the design of the overall system. The most relevant standards are introduced and explained, so that student can attain information from past and especially the forthcoming wireless standards. Student can also observe and explain the performance of these technologies with variable system and channel parameters through the course laboratory exercise.

Contents:

Digital transmission link, wideband radio channels, multiple access techniques, spread spectrum and DS-CDMA techniques, OFDM techniques, UWB techniques, applications and most common standards

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 20 h and the compulsory design work with a simulation program (20 h).

Target group:

3 rd year bachelor's degree students

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Defined during the lectures.

Assessment methods and criteria:

The course is passed with a final examination and the accepted simulation work report. Grade is based on exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5.

Person responsible:

Matti Latva-aho

Working life cooperation:

-

Other information:

-

521384A: Basics in Radio Engineering, 5 op

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

ECTS Credits:

5

Language of instruction:

Finnish

Timing:

Fall, periods 1-2

Learning outcomes:

After completing the course the student can define what radio engineering is and list its separate areas. He /she is also able to describe different terms and applications of radio engineering. Using Maxwell's equations the student can solve the propagation of radio waves in a homogeneous medium, the reflection and transmission at an interface of two lossless media, the power and energy of the electromagnetic fields, as well as, the radio wave propagate on in common transmission lines and waveguides. In addition, he/she is able to apply these solutions to typical problems in radio engineering. The student can utilize the

methods based on the Smith chart for the impedance matching of microwave circuits and antennas. He /she can describe the operation of passive transmission line and waveguide devices, resonators and filters, as well as, the operation of the circuits based on the semiconductor devices. In addition, he/she is able to calculate their characteristics with the microwave circuit theory. The student is capable to describe the antenna terms, to classify antenna types and antenna arrays, as well as, to calculate the electromagnetic fields radiated by them. He/she can classify and describe the most significant radio wave propagation mechanisms occurring over the radio links on the Earth's surface, through the troposphere and via the ionosphere. The student is able to summarize the structure of a radio system and to calculate the properties of its blocks. In addition, he/she can design a free-space radio link using the link budget. The student can identify the biological effects and safety standards of radio waves and can apply them to himself or herself and to other people.

Contents:

Introduction to radio waves and radio engineering. Fundamentals of electromagnetic fields. Transmission lines and waveguides. Impedance matching. Microwave circuit theory. Passive transmission line and waveguide devices. Resonators and filters. Circuits based on semiconductor devices. Antennas. Propagation of radio waves. Radio system. Applications of radio engineering. Biological effects and safety standards.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 26 h and exercises 16 h.

Target group:

3 rd year bachelor's degree students.

Prerequisites and co-requisites:

Elementary knowledge of the electromagnetic theory.

Recommended optional programme components:

-

Recommended or required reading:

In Finnish: Antti Räisänen & Arto Lehto: Radiotekniikan perusteet. Otatieto, 2011; also older versions of the book can be used as a course book. In English: Antti V. Räisänen & Arto Lehto: Radio Engineering for Wireless Communication and Sensor Applications, Artech House, 2003. Additional reading in Finnish: Jyrki Louhi & Arto Lehto: Radiotekniikan harjoituksia. Otatieto, 1995.

Assessment methods and criteria:

The course is passed with a final examination.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5.

Person responsible:

Markus Berg

Working life cooperation:

-

Other information:

-

521453A: Operating Systems, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Computer Science and Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Juha Röning

Opintokohteen kielet: English

Leikkaavuudet:

ay521453A   Operating Systems (OPEN UNI)   5.0 op

ECTS Credits:

5

Language of instruction:

In Finnish, material available in English

Timing:

Spirng, periods 5-6

Learning outcomes:

After the course the student is capable of explaining the basic structure and functioning of operating system. He/She is able to point the problems related to process management and synchronization as well as is able to apply learned methods to solve basic problems. Student is capable of explaining the cause and effect related to deadlocks and is able to analyse them related to common circumstances in operating systems. Additionally, the student is able to explain the basics of memory management, the use of virtual memory in modern operating systems as well as the structure of the most common file-systems.

Contents:

Topics: operating system structure and services, process management, process synchronization, deadlocks, memory management, virtual memory, file-systems.

Mode of delivery:

Face-to-face.

Learning activities and teaching methods:

Lectures 30 h, laboratory exercise 6 h, the rest as independent work.
The course consists of lectures and laboratory work, which includes pre-exercise and guided exercise performed in a group of one or two students in the unix environment.

Target group:

Computer Science and Engineering students and other Students of the University of Oulu.

Prerequisites and co-requisites:

521141P Elementary Programming, 521142A Embedded Systems Programming, 521267A Computer Engineering

Recommended optional programme components:

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

Recommended or required reading:

Lecture notes (in Finnish) and exercise material. Silberschatz A., Galvin P., and Gagne G.: Operating System Concepts, 6th edition (or newer), John Wiley & Sons, Inc., 2003. Chapters 1-12.

Assessment methods and criteria:

The course is passed the final examination and accepted laboratory working.

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:

Juha Röning

Working life cooperation:

-

521457A: Software Engineering, 5 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Computer Science and Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Juha Röning

Opintokohteen kielet: English

Leikkaavuudet:

ay521457A   Software Engineering (OPEN UNI)   5.0 op

ECTS Credits:

5

Language of instruction:

Finnish. Material available in English.

Timing:

Autumn, periods 1-3.

Learning outcomes:

After finishing the course, the student knows the basic concepts of software and real-time systems, the different areas of project management, the phases of software development and the goals and tasks of them, is able to use structural methods for defining systems and knows the principles of object-oriented design and analysis. After the course, the student has basic knowledge of utilizing software tools for structural analysis and design.

Contents:

Problematics of software development and the special features of real-time systems in this regard. Software development is viewed in regard to project management and actual implementation: 1. process models, 2. requirements specification, 3. project management basics: design, metrics, risk management, resource management, follow up, quality control, product control, 5. structural analysis and design, 5. software testing methods and strategies, 6. introduction to object-oriented analysis and design.

Mode of delivery:

Face-to-face.

Learning activities and teaching methods:

The course consists of lectures and a laboratory design exercise. The course is completed by a final exam and a successfully completed exercise. Lectures 30 h, laboratory design (in period 3) 12 h, the rest of the self-study.

Target group:

Computer Science and Engineering students and other Students of the University of Oulu.

Prerequisites and co-requisites:

521141P Elementary Programming, 521142A Embedded Systems Programming.

Recommended optional programme components:

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

Recommended or required reading:

R.S. Pressman: Software Engineering - A Practitioner's Approach. Sixth Edition. McGraw-Hill 2005, chapters 1-11, 13-14 and 21-27. Older editions (4th and 5th) can also be used as a reference. In this case the lectures are based on chapters 1-20.

Assessment methods and criteria:

Final exam and accepted laboratory 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:

Juha Röning

Working life cooperation:

-

521275A: Embedded Software Project, 8 op

Voimassaolo: 01.08.2007 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Computer Science and Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Juha Röning

Opintokohteen kielet: English

ECTS Credits:

8

Language of instruction:

Material of the course is available in English, lecturing is given in English.

Timing:

Spirng, periods 4-6.

Learning outcomes:

Embedded software project is the final course in the Bachelor's degree. The skills to pass this course have been acquired in precious courses. During the course, students work in groups to implement a program into an embedded system and write a technical report of the work. The subject of the program is not necessarily covered in previous courses.
After completing the course work, students have demonstrated that they can employ their skills in acquiring information to find a feasible solution to a given problem while still addressing the constraints imposed by a given embedded system. The student has shown that they are capable of designing and then implementing the non-trivial solution as a program to the given embedded system. Furthermore, they have demonstrated that they are capable of writing good-quality scientific text, including a literature survey, theory, technical documentation, testing documentation and other necessary chapters.

Contents:

This course familairizes the student with modern embedded system development with modern methods and tools. Topics: Development tools, practical application program for an embedded system.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Pair project with monitoring meetings and a compulsory exercise. Lectures 30 h, design exercise in period 4-6 180 h.

Target group:

Computer Science and Engineering students and other Students of the University of Oulu.

Prerequisites and co-requisites:

521457A Software Engineering, 521142A Embedded Systems Programming. In addition, 521453A Operating Systems be beneficial.

Recommended optional programme components:

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

Recommended or required reading:

Data periodicals, handouts, handbooks

Assessment methods and criteria:

Project 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:

Juha Röning, Teemu Tokola

Working life cooperation:

None.

521144A: Algorithms and Data Structures, 6 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Computer Science and Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Susanna Pirttikangas

Opintokohteen kielet: Finnish

Leikkaavuudet:

811312A   Data Structures and Algorithms   5.0 op

ECTS Credits:

6

Language of instruction:

Finnish. The course can be completed in English by answering the lecture questions and doing the laboratory exercises and the final exercise.

Timing:

Fall, periods 1-3.

Learning outcomes:

Upon completing the required coursework, the student is able to evaluate algorithms and data structures and alternatives for implementing them. Moreover, the student is able to design and implement algorithms and data structures.

Contents:

Data structures, algorithms, complexity.

Mode of delivery:

Web-based teaching and face-to-face teaching.

Learning activities and teaching methods:

20 h lectures; 10 h laboratory exercises; the rest as independent work.

Target group:

Computer Science and Engineering students and other Students of the University of Oulu.

Prerequisites and co-requisites:

Required: "521141P Elementary Computing" or a course with similar learning outcomes; recommended: " 031023P Mathematical Structures for Computer Science".

Recommended optional programme components:

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

Recommended or required reading:

Will be announced at the beginning of the course.

Assessment methods and criteria:

Students answer questions after each lecture and do the laboratory exercises and the final exercise. Assessment is based on these three elements; passing the course requires points from each element. More detailed information on assessment can be found from http://www.oulu.fi/cse/studying/courses. 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:

Susanna Pirttikangas

Working life cooperation:

None.

521145A: Human-Computer Interaction, 5 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Computer Science and Engineering

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Timing:

Autumn, periods 2-3

Learning outcomes:

Upon completing the course the student is able to explain the Human Computer Interaction (HCI) fundamentals, explain evaluation and prototyping techniques, explain how HCI can be incorporated in the software development process.

Contents:

Human and computer fundamentals, design and prototyping, evaluation techniques, data collection and analysis.

Mode of delivery:

Face to face teaching.

Learning activities and teaching methods:

Lectures (20 h), exercises (20 h), and practical work (95 h). The course is passed with an approved practical work. The implementation is fully English.

Target group:

Computer Science and Engineering students and other Students of the University of Oulu.

Prerequisites and co-requisites:

None. No prior courses are required.

Recommended optional programme components:

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

Recommended or required reading:

All necessary material will be provided by the instructor.

Assessment methods and criteria:

The assessment is project-based. Students have to complete three group-based activities throughout the semester: design & prototyping (40%), conduct an evaluation (40%), and complete a report of the activities (20%). Passing criteria: all 3 elements (designs, evaluation, report) must be completed, each receiving more than 50% of the available points.
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:

Vassilis Kostakos

521150A: Introduction to Internet, 5 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Electrical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Ojala, Timo Kullervo

Opintokohteen kielet: Finnish

ECTS Credits:

5

Language of instruction:

All materials are in English, lectures are given in Finnish.

Timing:

Spring, periods 4-5.

Learning outcomes:

Upon completing the course the student is able to explain the structure of the public Internet and the TCP/IP protocol stack, solve simple Internet problems, and design and implement a small Internet application.

Contents:

Internet's design principles and architecture, TCP/IP protocol stack, most important access networks, most important Internet applications, basics of Internet security.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 32 h / problem solving exercises 12 h / laboratory exercises 12 h / course work 25 h / self-study 52 h. Problem solving exercises, laboratory exercises and course work are completed as group work.

Target group:

Computer Science and Engineering students and other Students of the University of Oulu.

Prerequisites and co-requisites:

None.

Recommended optional programme components:

-

Recommended or required reading:

Will be announced at the beginning of the course.

Assessment methods and criteria:

The course uses continuous assessment so that there are 4 intermediate exams. Alternatively, the course can also be passed with a final exam. The course includes a mandatory course work.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course uses numerical grading scale 1-5.

Person responsible:

Professor Timo Ojala.

Working life cooperation:

-

521467A: Digital Image Processing, 5 op

Voimassaolo: 01.08.2012 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Computer Science and Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Esa Rahtu
Opintokohteen kielet: Finnish
Leikkaavuudet:

    ay521467A   Digital Image Processing (OPEN UNI)   5.0 op

ECTS Credits:

5

Language of instruction:

Lectures in Finnish and exercises in English. Course can be passed in Finnish and English.

Timing:

Autumn, periods 1-3.

Learning outcomes:

After completing the course the student understands the basic theory of digital image processing and knows its main applications. He is able to apply spatial and frequency domain and wavelet based methods in image enhancement, restoration, compression, segmentation and recognition.

Contents:

This course provides an introduction to digital image processing and machine vision. Topics: 1.Introduction, 2.Image enhancement, 3.Image restoration,
4. Color image processing, 5. Wavelets, 6. Image compression,7. Morphological image processing, 8. Image segmentation, 9. Representations and descriptions, 10. Pattern recognition.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 25 h, exercises 7 h and Matlab design exercises 25 h. The rest as independent work.

Target group:

Computer Science and Engineering students and other Students of the University of Oulu.

Prerequisites and co-requisites:

None.

Recommended optional programme components:

In order to obtain deep understanding of the content, it is a benefit if the student has completed the first year mathematic courses in the computer science and engineering BSc program or otherwise has equivalent knowledge.

Recommended or required reading:

Gonzalez, R.C., Woods, R.E.: Digital Image Processing, Second Edition, Addison-Wesley, 2002 (see course website: http://www.ee.oulu.fi/research/imag/courses/dkk/). Lecture notes and exercise material.

Assessment methods and criteria:

The course is passed by a final exam and programming 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:

Matti Pietikäinen, 2013 Esa Rahtu

Working life cooperation:

None.

Compulsory

521467A-01: Digital image processing, exam, 0 op

Voimassaolo: 01.08.2012 -
Opiskelumuoto: Intermediate Studies
Laji: Partial credit
Vastuuyksikkö: Department of Computer Science and Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Esa Rahtu
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

521467A-02: Digital image processing, Exercise work, 0 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Intermediate Studies

Laji: Partial credit

Vastuuyksikkö: Department of Computer Science and Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Esa Rahtu

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

521484A: Statistical Signal Processing, 5 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Computer Science and Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Heikkilä, Janne Tapani

Opintokohteen kielet: Finnish

Leikkaavuudet:

521348S   Statistical Signal Processing 1   5.0 op

ECTS Credits:

5

Language of instruction:

Finnish, Course can be passed in English.

Timing:

Spring, periods 4-6.

Learning outcomes:

Upon completion of the course, the student is able to utilize the generic linear model as a representation for parameter estimation. He can apply typical deterministic and random parameter estimation methods for different estimation problems. He is able to determine statistical properties of estimators and make comparisons between them. The student can also form a basic state-variable model and utilize Kalman filtering for state estimation. Moreover, he is able to apply basic methods of detection theory for solving simple detection problems. After the course, the student can implement the learned methods and assess their statistical properties with the Matlab software.

Contents:

This course provides basic knowledge of statistical signal processing, in particular, estimation theory and its applications in signal processing. Topics: 1. Introduction, 2. Modeling of estimation problems, 3. Least Squares estimation, 4. BLUE-estimation, 5. Signal detection, 6. ML estimation, 7. MS estimation, 8. MAP estimation, 9. Kalman Filter.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures (30 h), exercises (24 h) and Matlab design exercise (10 h). The rest as independent work.

Target group:

Computer Science and Engineering students and other Students of the University of Oulu.

Prerequisites and co-requisites:

031019P Matrix Algebra, 031021P Probability and Mathematical Statistics

Recommended optional programme components:

521337A Digital Filters, 031050A Signal Analysis. These courses provide complementary information on digital signal processing and stochastic signals. The courses are recommended to be studied either in advance or simultaneously.

Recommended or required reading:

J. Mendel: Lectures in estimation theory for signal processing, communications and control, Prentice-Hall, 1995. M.D. Srinath, P.K. Rajasekaran, R. Viswanathan: Introduction to Statistical Signal Processing with Applications, Prentice-Hall, 1996, Chapter 3. Lecture notes and exercise material.

Assessment methods and criteria:

The course is passed with intermediate exams or final exam and accepted Matlab 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:

Janne Heikkilä

Working life cooperation:

None.

521495A: Artificial Intelligence, 5 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Computer Science and Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Esa Rahtu

Opintokohteen kielet: English

Leikkaavuudet:

ay521495A   Artificial Intellig (OPEN UNI)   5.0 op

ECTS Credits:

5

Language of instruction:

In Finnish. The exam and coursework can be passed in English.

Timing:

Periods 4-5.

Learning outcomes:

After taking the course, the student is able to identify the types of problems that can be solved using methods of artificial intelligence. The student knows the basic concepts of intelligent agents, the common search methods used in artificial intelligence, logic based reasoning and applying planning techniques to problems of artificial intelligence. The student can also apply simple methods to reasoning under uncertainty and machine learning from observation. In addition the student will be able to implement the most common search methods.

Contents:

1. Introduction, 2. Intelligent agents, 3. Solving problems by searching, 4. Informed search and exploration, 5. Constraint satisfaction problems, 6. Games, 7. Logical agents, 8. First-order logic, 9. Inference in first-order logic, 10. Planning, 11. Uncertainty, 12. Bayesian Networks, 13. Learning from observation.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

25 hours of lectures and a programming exercise (approximately 25 hours) during periods 4-5, the rest as independent work.

Target group:

Computer Science and Engineering students and other Students of the University of Oulu.

Prerequisites and co-requisites:

Programming skills.

Recommended optional programme components:

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

Recommended or required reading:

Primary text book and slides (in English): Russel S., Norvig P.: Artificial Intelligence, A Modern Approach (AIMA), Second Edition, Prentice Hall, 2003. Lecture notes (in Finnish): Syrjänen, M.: Tietämystekniikan peruskurssin luentomoniste, Teknillinen korkeakoulu, 2004. More details on the course WWW page http://www.ee.oulu.fi/research/imag/courses/ai/.

Assessment methods and criteria:

The course is passed with a final exam and a passed programming exercise.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

1-5 / fail.

Person responsible:

Professor Matti Pietikäinen, 2013 Esa Rahtu.

Working life cooperation:

-

812346A: Object Oriented Analysis and Design, 6 op

Voimassaolo: 01.08.2011 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Information Processing Science
Arvostelu: 1 - 5, pass, fail
Opettajat: Iisakka, Juha Veikko
Opintokohteen kielet: Finnish

ECTS Credits:
6 ECTS credits/160 hours of work

Language of instruction:
Finnish

Timing:
2nd year, autum semester, period 1

Learning outcomes:
After completing the course, the students know possibilities of UML-language family to describe different views. They can picture a task using Use cases and scenarios. Moreover they can produce detailed descriptions using activity-, class-, interaction- and state diagrams. They know principles of object-orientedness and can use abstract as well interface classes. Additionally they can model user interface by state diagrams.
They understand what design patterns are and how they are described and categorised.

Contents:
Principles of object orientation and object-oriented programming; quality criteria of object orientation; design patterns; case use; activity, class, interaction and state machine diagrams; class realisation.

Mode of delivery:
Face-to-face teaching

Learning activities and teaching methods:

Lectures 34h, compulsory exercises and assignments 30h, independent work 96h.

Prerequisites and co-requisites:

Basic knowledge of programming and information systems analysis and design.

Recommended optional programme components:

Recommended or required reading:

Bennet, McRobb & Farmer: Object-oriented systems analysis and design, Using UML

Assessment methods and criteria:

Assessment methods and criteria: Refer to course website
Read more about assessment criteria at the University of Oulu webpage.

Grading:

1-5

Person responsible:

Juha Iisakka

Working life cooperation:

No

A440134: Module Preparing for the Option, Information Engineering (optional studies), 20 op

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

Ei opintojaksokuvauksia.

Electives

031018P: Complex Analysis, 4 op

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

031077P   Complex analysis   5.0 op

ECTS Credits:

4

Language of instruction:

Finnish

Timing:

Fall semester, periods 1-2

Learning outcomes:

After completing the course the student is able to calculate the derivative and integral of complex function, is able to calculate contour integrals, understands Cauchy's integral theorem and its consequences, is able

to form the series representation of analytic function and use the Residue theory for computing line integrals. Furthermore the student is able to apply complex analysis analysis techniques to simple problems in signal processing.

Contents:

Complex numbers and functions, complex derivative and analyticity, complex series, Cauchy's integral theorem and its consequences, Laurent and Taylor expansions, Residue, the argument principle, Möbiius transformation, applications to signal analysis

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:

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

Recommended optional programme components:

Prerequisite to signal Analysis.

Recommended or required reading:

 E.B. Saff and A.D. Saddler, Fundamentals of Complex Analysis with applications to engineering and science.

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:

Keijo Ruotsalainen

Working life cooperation:

-

Other information:

-

031050A: Signal Analysis, 4 op

Voimassaolo: 01.08.2012 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Mathematics Division
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

   031080A   Signal Analysis   5.0 op

ECTS Credits:

4
Language of instruction:

Finnish
Timing:

3-4

Learning outcomes:

After the course the student is able to calculate the energy, the power, the convolution and the frequency spectrum of discrete and analog, periodic and non-periodic deterministic signals. The student is able to study the stationarity, the ergodicity, the mutual dependence and the frequency content of random signals by means of the auto- and cross-correlation functions, the covariance function and the power- and cross-power spectral densities. The student is able to explain the mathematical grounds of the most central optimal systems used in signal estimation, and can solve related problems.

Contents:

Signals, classification, frequency. Orthogonal expansions. Fourier analysis, analog and digital signal, fast Fourier transform. Random variable. Random signal. Stationarity, ergodicity, autocorrelation. Power spectral density. Autoregressive, Gaussian and Poisson processes. Signal estimation, orthogonality principle, Yule-Walker equations, Wiener filter. Matched filter.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 40 h /Group work 20 h. Homework assignments.

Target group:

-

Prerequisites and co-requisites:

The recommended prerequisite is the completion of the courses 031019P Matrix Algebra, 031021P Probability and Mathematical Statistics, 031018P Complex Analysis.

Recommended optional programme components:

-

Recommended or required reading:

Lecture notes. Proakis, J.G., Manolakis, D.K.: Introduction to Digital Signal Pro-cessing. Shanmugan, K.S., Breipohl, A.M.: Random Signals, Detection, Estimation and Data Analysis.

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:

Vesa Kotila, Pasi Ruotsalainen

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:

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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:

-

031023P: Mathematical Structures for Computer Science, 5 op

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

    ay031023P   Mathematical Structures for Computer Science (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 is able to apply result of logic to find the truth value of logical statement. He can express sentences of natural language by symbols of logic. He can use arithmetic operations on different number bases. The student is able to apply formal methods of discrete mathematics to model simple information processing problems.

Contents:

Elementary logic. Mathematical induction. Boolean algebra and set theory. Theory of automata and formal languages. Some graph theory.

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:

Rosen K.H.: Discrete Mathematics and Its Applications. Gersting J.L.: Mathematical Structures for Computer Science.

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:

-

521104P: Introduction to Material Physics, 5 op

Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Department of Electrical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Juha Hagberg
Opintokohteen kielet: Finnish

ECTS Credits:

5

Language of instruction:

In Finnish.

Timing:

Periods 1-3.

Learning outcomes:

After completing the course, student is able to explain the basic concepts related to materials physics. The student can outline the crystal structure of the solids and the crystalline binding and is able to explain the principles of the theory used in describing the different kinds of waves traveling in solids. Moreover, he or she can explain the principles of statistical mechanism and use them to explore thermal properties of the solid. The student can also outline the free electron model of metals and the formation of the energy band structure of the crystals and their significance to the electrical properties of materials. He or she is able to explain the basic phenomena related to semiconductors and is able to calculate the charge carrier distributions in them.

Contents:

Crystal structures and cohesion. Waves and defects in crystals. Basic principles of quantum mechanics and thermal properties (statistics). Free electron model of metals, energy bands and Brillouin zones in crystals. Basic phenomena of semiconductors.

Mode of delivery:

Lectures, exercises and assignments.

Learning activities and teaching methods:

Lectures 30 h, and exercises 30 h, assignments 30 h, independent study 45 h.

Target group:

-

Prerequisites and co-requisites:

Required physics and mathematics courses.

Recommended optional programme components:

The student should take the course 766326A Atomifysiikka at same time or beforehand.

Recommended or required reading:

H.M. Rosenberg: The Solid State, Clarendon Press, Oxford, 1988. B. Streetman: Solid State Electronic Devices, Prentice Hall, New Jersey, 1995.

Assessment methods and criteria:

Grade is based on exams and assignments, grading principles will be defined in the beginning of the course.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numeric grading 1-5.

Person responsible:

Juha Hagberg

Working life cooperation:

-

Other information:

-

521205A: Principles of Semiconductor Devices, 4,5 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Electrical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Juha Hagberg
Opintokohteen kielet: Finnish
Leikkaavuudet:

521071A   Principles of Semiconductor Devices   5.0 op

ECTS Credits:

4,5

Language of instruction:

Finnish / English

Timing:

Periods 4 - 6

Learning outcomes:

Student will be able to explain physical phenomena in semiconductor materials and junctions; describe main types and characteristics of semiconductor diodes and transistors. Student will be able to explain physical principles of operation and to estimate ideal characteristics of the devices.

Contents:

Junctions. Semiconductor diodes and lasers. Bipolar junction transistors. Field effect transistors. Schwitching devices.

Mode of delivery:

Lectures and exercises.

Learning activities and teaching methods:

Lectures 30h/ Exercises 30h/ Self-study 60h.

Target group:

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Prerequisites and co-requisites:

521104P Introduction to materials physics.

Recommended optional programme components:

-

Recommended or required reading:

Lectures. Book: Streetman, B.: Solid state electronic devices, Prentice-Hall, New Jersey, 2000 (chapters 5 - 8, 11).

Assessment methods and criteria:

Will be notified in the beginning of lectures.
Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

Numerical grading 1 – 5.

Person responsible:

Juha Hagberg

Working life cooperation:

-

Other information:

-

521209A: Electronics Components and Materials, 2 op

Voimassaolo: 01.08.2011 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Electrical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Jari Hannu
Opintokohteen kielet: Finnish
Leikkaavuudet:

521077P   Introduction to Electronics   5.0 op

ECTS Credits:

2

Language of instruction:

Finnish

Timing:

4-5

Learning outcomes:

Student is able to identify and classify electronics components and compare their properties. Students can describe electric conductivity and apply the phenomenon on designing and choosing resistors. Student is able to estimate the difference between dielectric materials and how they affect the properties of a capacitor. Student can compare properties of magnetic materials and how identify they affect on inductive components. Student can identify semiconductivity and is able to list typical semiconductor components. Student can classify different circuit board techniques and is able to choose proper coupling techniques. In addition student can identify the future technologies of electronics materials

Contents:

Electromagnetic properties of materials (conductivity, dielectricity, magnetism and semiconductivity). Electronics components (resistors, capacitors, inductive components and semiconductors). Interconnection technologies and circuit board technologies. The future of electronic materials and application areas.

Mode of delivery:

Classroom teaching

Learning activities and teaching methods:

Lectures (24 h) and lecture exercises. The course is passed by a final exam or other method presented at the lectures.

Target group:

First year electrical engineering students.

Prerequisites and co-requisites:

None.

Recommended optional programme components:

Electricity and Magnetism

Recommended or required reading:

Lecture material; Materials science and engineering: an introduction / Willam D. Callister, chapters 1, 18 and 20; Electronic components and technology / S. J. Sangwine. Chapters 1,2,3,5 and 7

Assessment methods and criteria:

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

Grading:

1-5

Person responsible:

Jari Hannu

Working life cooperation:

-

Other information:

-

521218A: Introduction to Microfabrication Techniques, 4 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Electrical Engineering

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

   521070A   Introduction to Microfabrication Techniques   5.0 op

ECTS Credits:

4

Language of instruction:

In Finnish.

Timing:

Periods 4-6

Learning outcomes:

Upon completing the course the student is able
-       to explain properties of micro- and nanoelectronics and micro- and nanomechanics materials, processing of source materials and basics of fabrication methods
-       utilize the knowledge given by the course in developing applications to be realized by micro- and nanofabrication methods.

Contents:

Lithography. Film growing methods. Dry and wet etching methods. Bulk and surface micromachining. Materials, devices and fabrication methods of integrated circuits. Considerations of modeling, packaging, scaling and power in miniaturized systems. Application examples.

Mode of delivery:

The course will be implemented as face to face teaching.

Learning activities and teaching methods:

24 hours lectures. Demonstrations and design exercises.

Target group:

-

Prerequisites and co-requisites:

The recommended prerequisite is to familiarize with the courses 521104P Introduction to Materials Physics and 521205A Principles of Semiconductor Devices.

Recommended optional programme components:

-

Recommended or required reading:

Lecture notes. Text book will be shown later.

Assessment methods and criteria:

Final exam and passing both design exercise and demonstration.
Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The final exam utilizes a numerical grading scale 1-5.

Person responsible:

Merja Teirikangas

Working life cooperation:

-

Other information:

-

521302A: Circuit Theory 1, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Electrical Engineering

Arvostelu: 1 - 5, pass, fail
Opettajat: Rahkonen, Timo Erkki
Opintokohteen kielet: Finnish

ECTS Credits:

5

Language of instruction:

Finnish. Exams can be arranged in English on demand.

Timing:

Autumn, periods 1-3

Learning outcomes:

After the course the student can
- write and solve the equations describing the operation of a given electrical circuit
- solve the sinusoidal steady-state solution using complex phasor arithmetics
- solve time responses of electric circuits
- simplify electrical circuits e.g. using equivalent circuits
- simulate simple circuits and choose an appropriate circuit simulation method

Contents:

Equation of basic circuit elements, circuit laws and systematic building of network equations. Calculation of time and frequency responses. Use of complex phasor arithmetics. Basics of the use of circuit simulators.

Mode of delivery:

 Classroom.

Learning activities and teaching methods:

30h lectures, 22 h exercises, and a simulation exercise (10h)

Target group:

Finnish BSc students.

Prerequisites and co-requisites:

Matrix algebra, complex arithmetics, differential equations.

Recommended optional programme components:

-

Recommended or required reading:

Nilsson, Riedel: Electric Circuits (6th or 7th ed., Prentice-Hall 1996), Chapters 1-11.

Assessment methods and criteria:

Final exam. Also the simulation exercise must be passed.
Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

1-5

Person responsible:

Prof. Timo Rahkonen

Working life cooperation:

-

Other information:

-

521306A: Circuit Theory 2, 4 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Electrical Engineering
Arvostelu: 1 - 5, pass, fail

Opettajat: Rahkonen, Timo Erkki

Opintokohteen kielet: Finnish

Leikkaavuudet:

   521303A   Circuit Theory 2   5.0 op

ECTS Credits:

4

Language of instruction:

Finnish. Exams can be arranged in English on demand.

Timing:

Spring, periods 5-6

Learning outcomes:

After the course the student can
- use Laplace transform for solving time and frequency response of electric circuits
- derive continous-time transfer functions., solve their poles and zeros and understand the meaning of those
- draw the pole-zero map and Bode plots of any given transfer function
- construct 2-port parameter models of a given circuit

Contents:

Use of Laplace transform in network analysis. Properties of network functions, poles and zeros, Boden magnitude and phase plots. 2-port parameter models.

Mode of delivery:

Classroom

Learning activities and teaching methods:

30h lectures, 22 h exercises.

Target group:

Finnish BSc students.

Prerequisites and co-requisites:

Basics of circuit theory, differential equations.

Recommended optional programme components:

-

Recommended or required reading:

Nilsson, Riedel: Electric Circuits (6th or 7th ed., Prentice-Hall 1996), Chapters 12-18.

Assessment methods and criteria:

Course is examined by a final exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

1-5

Person responsible:

Prof. Timo Rahkonen

Working life cooperation:

-

Other information:

-

521431A: Principles of Electronics Design, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Electrical Engineering

Arvostelu: 1 - 5, pass, fail
Opettajat: Juha Häkkinen
Opintokohteen kielet: Finnish

ECTS Credits:

5

Language of instruction:

Finnish.

Timing:

Spring, periods 4-6

Learning outcomes:

On completion of the study module students should be able to analyze and design such electronic building blocks as rectifiers, clamping circuits, amplifiers and CMOS logic elements using diodes, operational amplifiers and MOS and bipolar junction transistors.

Contents:

Analogue and digital circuits, basic amplifier related concepts, operational amplifier, diodes and diode circuits, single stage bipolar and MOS transistor amplifiers, small signal modeling and analyzing ac properties of amplifiers, internal structures of digital circuits (mainly CMOS), MOS/CMOS switch.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 30 h and exercises 20 h.

Target group:

-

Prerequisites and co-requisites:

Circuit Theory I

Recommended optional programme components:

 Recommended course Principles of Semiconductor Devices

Recommended or required reading:

Lecture notes, Razavi: Fundamentals of Microelectronics (John Wiley & Sons 2008), chapters 1-8 and 15 partially or Sedra & Smith : Microelectronic Circuits (6th ed.), chapters 1-5 and 14.

Assessment methods and criteria:

Final or 2 mid-term exams.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 1-5.

Person responsible:

Juha Häkkinen

Working life cooperation:

-

Other information:

-

521432A: Electronics Design I, 5 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Electrical Engineering
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

ECTS Credits:

5

Language of instruction:

Finnish.

Timing:

Autumn, periods 1-3

Learning outcomes:

On completion of the study module students should be able to recount the principles covering the design of multistage amplifiers, analyze and set the frequency response of a transistor amplifier and make use of feedback to improve the properties of an amplifier in the desired manner. They should also be able to analyze the stability of a given degree of feedback amplification and to dimension an amplifier correctly to ensure stability. Students should similarly be able to describe the principles governing the design of power amplifiers, to make widespread use of operational amplifiers for realizing electronic circuits and to take account of the limitations imposed by the non-idealities inherent in operational amplifiers. They should be able to design low-frequency oscillators, to explain the operating principles of radio frequency oscillators and tuned amplifiers and to recount the basic principles governing the functions and properties of emitter-coupled logic.

Contents:

Frequency response of a transistor amplifier, differential amplifier, feedback, stability and nonidealities of a feedback amplifier, comparator, output stages and power amplifiers, applications of operational amplifier, oscillators, tuned amplifiers and ECL logic.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 40 h and exercises 20 h.

Target group:

Not defined.

Prerequisites and co-requisites:

Principles of electronic design

Recommended optional programme components:

This course is required when participating in Laboratory Exercises on Analogue Electronics

Recommended or required reading:

Lecture notes, Razavi: Fundamentals of Microelectronics (John Wiley & Sons 2008), chapters 10-13-8 and 14, partially or Sedra & Smith : Microelectronic Circuits (6th ed.), chapters 7,8,9,13 and partially 11 and 12.

Assessment methods and criteria:

Final or 2 mid-term exams.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 1-5.

Person responsible:

Juha Häkkinen

Working life cooperation:

-

Other information:

-

521337A: Digital Filters, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Computer Science and Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Hannuksela, Jari Samuli

Opintokohteen kielet: Finnish

Leikkaavuudet:

   ay521337A   Digital Filters (OPEN UNI)   5.0 op

ECTS Credits:

5

Language of instruction:

Finnish, English study material available

Timing:

Spring, period 5-6.

Learning outcomes:

Upon completing the required coursework, the student is able to specify and design respective frequency selective FIR and IIR filters using the most common methods. He is also able to solve for the impulse and frequency responses of FIR and IIR filters given as difference equations, transfer functions, or realization diagrams, and can present analyses of the aliasing and imaging effects based on the responses of the filters. Moreover, the student is able to explain the impacts of finite word length in filter design. After the course the student has the necessary basic skills to use signal processing tools available in Matlab environment and to judge the results.

Contents:

1. Sampling theorem, aliasing and imaging, 2. Discrete Fourier transform, 3. Z-transform and frequency response, 4. Correlation and convolution, 5. Digital filter design, 6. FIR filter design and realizations, 7. IIR filter design and realizations, 8. Finite word length effects and analysis, 9. Multi-rate signal processing.

Mode of delivery:

Face-to-face teaching (Lectures), independent work, group work

Learning activities and teaching methods:

Lectures and exercises 50 h. The design exercises familiarize the students with the methods of digital signal processing using the Matlab software package. The rest as independent work.

Target group:

Computer Science and Engineering students and other Students of the University of Oulu.

Prerequisites and co-requisites:

031018P Complex Analysis, 031050A Signal Analysis

Recommended optional programme components:

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

Recommended or required reading:

Lecture notes and exercise materials. Material is in Finnish and in English. Course book: Ifeachor, E., Jervis, B.: Digital Signal Processing, A Practical Approach, Second Edition, Prentice Hall, 2002.

Assessment methods and criteria:

The course can be passed either with week exams or a final exam. In addition, the exercises need to be returned and accepted.
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:

Jari Hannuksela

Working life cooperation:
None.

Compulsory

521337A-01: Digital filters, partial credit, 0 op

Opiskelumuoto: Intermediate Studies
Laji: Partial credit
Vastuuyksikkö: Department of Computer Science and Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Hannuksela, Jari Samuli
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

521337A-02: Digital filters, partial credit, 0 op

Opiskelumuoto: Intermediate Studies
Laji: Partial credit
Vastuuyksikkö: Department of Computer Science and Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Hannuksela, Jari Samuli
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

521359A: Telecommunication Engineering 1, 2,5 op

Voimassaolo: - 31.07.2012
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

521361A: Telecommunication Engineering II, 3 op

Voimassaolo: 01.08.1950 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Kari Heikki Antero Kärkkäinen
Opintokohteen kielet: Finnish
Leikkaavuudet:
521330A   Telecommunication Engineering   5.0 op

ECTS Credits:
3
Language of instruction:
Finnish

Timing:

Fall, periods 2-3

Learning outcomes:

After completing the course student can tell and analyze the essential and optional blocks of a digital communication system both in time and in frequency domain. Student also understands limitations resulting from transmission channel and can propose various methods to combat such effects. Using simple assumptions, student can analyze system performance mathematically and compare various modulation methods from the standpoint point of system resources. Student can evaluate standards and specifications of communication systems. Student can also apply obtained knowledge for practical system and sub-system design.

Contents:

Basic blocks of a digital transmission system, baseband digital transmission, binary and M-ary digital continuous-wave modulations, correlation and matched filter receivers and their bit error probability performance with AWGN channel, effects of band-limiting and multipath propagation and methods to combat against such effects, basics of information theory, basics of source coding and error-correction coding methods.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h and exercises 10

Target group:

3 rd year bachelor's degree students

Prerequisites and co-requisites:

Signal Analysis

Recommended optional programme components:

-

Recommended or required reading:

Lecture slides available in Finnish from TTK-OPTIMA system. Slides are based on the coursebook: R.E. Ziemer & W. H. Tranter: Principles of Communications - Systems, Modulation and Noise, 6th edition, 2010, John Wiley & Sons, selected parts of chapters 8, 9, 10, and 11.

Assessment methods and criteria:

The course is passed with a final examination.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5.

Person responsible:

Kari Kärkkäinen

Working life cooperation:

-

Other information:

-

521340S: Communications Networks I, 5 op

Opiskelumuoto: Advanced Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Savo Glisic
Opintokohteen kielet: English

ECTS Credits:

5

Language of instruction:

English

Timing:

Fall, periods 1-3

Learning outcomes:

Upon completing the required coursework, the student is able to list the functionalities of different layers of OSI and TCP/IP protocol models. The course gives the skills for the student to describe the basic structure of GSM, GPRS, EDGE, LTE and IEEE802.11 systems. The student is able to describe the basic protocol model of the UMTS radio interface and radio access network. The student knows the basic properties of routing protocols in ad hoc networks. The student will achieve skills to describe the main principles of mobility control, network security, cross-layer optimization. The course also gives the student the ability to explain the essential features of sensor networks.

Contents:

Communications architecture and protocols, adaptive network and transportation layers, mobility management, network security, network management, ad hoc and sensor networks, cross-layer optimization, examples of wireless communication networks.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 30 h and the compulsory design work with a simulation program (15 h).

Target group:

1 st year M.Sc. and WCE students

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Parts from: S. Glisic & B. Lorenzo: Wireless Networks: 4G Technologies (2nd ed.), 2009; S. Glisic: Advanced Wireless Communications: 4G Cognitive and Cooperative Technologies (2nd ed.), 2007.

Assessment methods and criteria:

The course is passed with a final examination and the accepted simulation work report. The final grade is based on examination.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5.

Person responsible:

Savo Glisic

Working life cooperation:

-

Other information:

Objective: The aim is to present the fundamentals of the structure, protocol and structure of digital data transmission networks. Technical implementation and application of the common data and local networks are also discussed.

521316A: Broadband Communications Systems, 4 op

Voimassaolo: 01.08.2006 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Opettajat: Matti Latva-aho

Opintokohteen kielet: Finnish

Leikkaavuudet:

   521329A   Hands-on Course in Wireless Communication   5.0 op

   521307A   Laboratory Exercises on Analogue Electronics   5.0 op

   521316S   Broadband Communications Systems   5.0 op

ECTS Credits:

4

Language of instruction:

Finnish

Timing:

Spring, periods 4-6

Learning outcomes:

Upon completing the required coursework, student can distinguish the basic transmission technologies used in the most important commercial wireless communication systems. Furthermore, the student can differentiate and compare the key points behind these technologies, why they are used and what are their advantages and disadvantages. Student can explain how the wireless channel impacts the design of the overall system. The most relevant standards are introduced and explained, so that student can attain information from past and especially the forthcoming wireless standards. Student can also observe and explain the performance of these technologies with variable system and channel parameters through the course laboratory exercise.

Contents:

Digital transmission link, wideband radio channels, multiple access techniques, spread spectrum and DS-CDMA techniques, OFDM techniques, UWB techniques, applications and most common standards

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 20 h and the compulsory design work with a simulation program (20 h).

Target group:

3 rd year bachelor's degree students

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Defined during the lectures.

Assessment methods and criteria:

The course is passed with a final examination and the accepted simulation work report. Grade is based on exam.
Read more about [assessment criteria](#) at the University of Oulu webpage.

Grading:

The course unit utilizes a numerical grading scale 1-5.

Person responsible:

Matti Latva-aho

Working life cooperation:

-

Other information:

-

521384A: Basics in Radio Engineering, 5 op

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

ECTS Credits:

5

Language of instruction:

Finnish

Timing:

Fall, periods 1-2

Learning outcomes:

After completing the course the student can define what radio engineering is and list its separate areas. He /she is also able to describe different terms and applications of radio engineering. Using Maxwell's equations the student can solve the propagation of radio waves in a homogeneous medium, the reflection and transmission at an interface of two lossless media, the power and energy of the electromagnetic fields, as well as, the radio wave propagate on in common transmission lines and waveguides. In addition, he/she is able to apply these solutions to typical problems in radio engineering. The student can utilize the methods based on the Smith chart for the impedance matching of microwave circuits and antennas. He /she can describe the operation of passive transmission line and waveguide devices, resonators and filters, as well as, the operation of the circuits based on the semiconductor devices. In addition, he/she is able to calculate their characteristics with the microwave circuit theory. The student is capable to describe the antenna terms, to classify antenna types and antenna arrays, as well as, to calculate the electromagnetic fields radiated by them. He/she can classify and describe the most significant radio wave propagation mechanisms occurring over the radio links on the Earth's surface, through the troposphere and via the ionosphere. The student is able to summarize the structure of a radio system and to calculate the properties of its blocks. In addition, he/she can design a free-space radio link using the link budget. The student can identify the biological effects and safety standards of radio waves and can apply them to himself or herself and to other people.

Contents:

Introduction to radio waves and radio engineering. Fundamentals of electromagnetic fields. Transmission lines and waveguides. Impedance matching. Microwave circuit theory. Passive transmission line and waveguide devices. Resonators and filters. Circuits based on semiconductor devices. Antennas. Propagation of radio waves. Radio system. Applications of radio engineering. Biological effects and safety standards.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 26 h and exercises 16 h.

Target group:

3 rd year bachelor's degree students.

Prerequisites and co-requisites:

Elementary knowledge of the electromagnetic theory.

Recommended optional programme components:

-

Recommended or required reading:

In Finnish: Antti Räisänen & Arto Lehto: Radiotekniikan perusteet. Otatieto, 2011; also older versions of the book can be used as a course book. In English: Antti V. Räisänen & Arto Lehto: Radio Engineering for Wireless Communication and Sensor Applications, Artech House, 2003. Additional reading in Finnish: Jyrki Louhi & Arto Lehto: Radiotekniikan harjoituksia. Otatieto, 1995.

Assessment methods and criteria:

The course is passed with a final examination.

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

Grading:

The course unit utilizes a numerical grading scale 1-5.

Person responsible:

Markus Berg

Working life cooperation:

-

Other information:

-

521453A: Operating Systems, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Computer Science and Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Juha Röning

Opintokohteen kielet: English

Leikkaavuudet:

   ay521453A   Operating Systems (OPEN UNI)   5.0 op

ECTS Credits:

5

Language of instruction:

In Finnish, material available in English

Timing:

Spirng, periods 5-6

Learning outcomes:

After the course the student is capable of explaining the basic structure and functioning of operating system. He/She is able to point the problems related to process management and synchronization as well as is able to apply learned methods to solve basic problems. Student is capable of explaining the cause and effect related to deadlocks and is able to analyse them related to common circumstances in operating systems. Additionally, the student is able to explain the basics of memory management, the use of virtual memory in modern operating systems as well as the structure of the most common file-systems.

Contents:

Topics: operating system structure and services, process management, process synchronization, deadlocks, memory management, virtual memory, file-systems.

Mode of delivery:

Face-to-face.

Learning activities and teaching methods:

Lectures 30 h, laboratory exercise 6 h, the rest as independent work.
The course consists of lectures and laboratory work, which includes pre-exercise and guided exercise performed in a group of one or two students in the unix environment.

Target group:

Computer Science and Engineering students and other Students of the University of Oulu.

Prerequisites and co-requisites:

521141P Elementary Programming, 521142A Embedded Systems Programming, 521267A Computer Engineering

Recommended optional programme components:

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

Recommended or required reading:

Lecture notes (in Finnish) and exercise material. Silberschatz A., Galvin P., and Gagne G.: Operating System Concepts, 6th edition (or newer), John Wiley & Sons, Inc., 2003. Chapters 1-12.

Assessment methods and criteria:

The course is passed the final examination and accepted laboratory working.

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:

Juha Röning

Working life cooperation:

-

521457A: Software Engineering, 5 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Computer Science and Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Juha Röning

Opintokohteen kielet: English

Leikkaavuudet:

ay521457A   Software Engineering (OPEN UNI)   5.0 op

ECTS Credits:

5

Language of instruction:

Finnish. Material available in English.

Timing:

Autumn, periods 1-3.

Learning outcomes:

After finishing the course, the student knows the basic concepts of software and real-time systems, the different areas of project management, the phases of software development and the goals and tasks of them, is able to use structural methods for defining systems and knows the principles of object-oriented design and analysis. After the course, the student has basic knowledge of utilizing software tools for structural analysis and design.

Contents:

Problematics of software development and the special features of real-time systems in this regard. Software development is viewed in regard to project management and actual implementation: 1. process models, 2. requirements specification, 3. project management basics: design, metrics, risk management, resource management, follow up, quality control, product control, 5. structural analysis and design, 5. software testing methods and strategies, 6. introduction to object-oriented analysis and design.

Mode of delivery:

Face-to-face.

Learning activities and teaching methods:

The course consists of lectures and a laboratory design exercise. The course is completed by a final exam and a successfully completed exercise. Lectures 30 h, laboratory design (in period 3) 12 h, the rest of the self-study.

Target group:

Computer Science and Engineering students and other Students of the University of Oulu.

Prerequisites and co-requisites:

521141P Elementary Programming, 521142A Embedded Systems Programming.

Recommended optional programme components:

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

Recommended or required reading:

R.S. Pressman: Software Engineering - A Practitioner's Approach. Sixth Edition. McGraw-Hill 2005, chapters 1-11, 13-14 and 21-27. Older editions (4th and 5th) can also be used as a reference. In this case the lectures are based on chapters 1-20.

Assessment methods and criteria:

Final exam and accepted laboratory 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:

Juha Röning

Working life cooperation:

-

521275A: Embedded Software Project, 8 op

Voimassaolo: 01.08.2007 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Computer Science and Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Juha Röning

Opintokohteen kielet: English

ECTS Credits:

8

Language of instruction:

Material of the course is available in English, lecturing is given in English.

Timing:

Spirng, periods 4-6.

Learning outcomes:

Embedded software project is the final course in the Bachelor's degree. The skills to pass this course have been acquired in precious courses. During the course, students work in groups to implement a program into an embedded system and write a technical report of the work. The subject of the program is not necessarily covered in previous courses.
After completing the course work, students have demonstrated that they can employ their skills in acquiring information to find a feasible solution to a given problem while still addressing the constraints imposed by a given embedded system. The student has shown that they are capable of designing and then implementing the non-trivial solution as a program to the given embedded system. Furthermore, they have demonstrated that they are capable of writing good-quality scientific text, including a literature survey, theory, technical documentation, testing documentation and other necessary chapters.

Contents:

This course famolairizes the student with modern embedded system development with modern methods and tools. Topics: Development tools, practical application program for an embedded system.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Pair project with monitoring meetings and a compulsory exercise. Lectures 30 h, design exercise in period 4-6 180 h.

Target group:

Computer Science and Engineering students and other Students of the University of Oulu.

Prerequisites and co-requisites:

521457A Software Engineering, 521142A Embedded Systems Programming. In addition, 521453A Operating Systems be beneficial.

Recommended optional programme components:

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

Recommended or required reading:

Data periodicals, handouts, handbooks

Assessment methods and criteria:

Project 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:

Juha Röning, Teemu Tokola

Working life cooperation:

None.

521144A: Algorithms and Data Structures, 6 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Computer Science and Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Susanna Pirttikangas

Opintokohteen kielet: Finnish

Leikkaavuudet:

   811312A   Data Structures and Algorithms   5.0 op

ECTS Credits:

6

Language of instruction:

Finnish. The course can be completed in English by answering the lecture questions and doing the laboratory exercises and the final exercise.

Timing:

Fall, periods 1-3.

Learning outcomes:

Upon completing the required coursework, the student is able to evaluate algorithms and data structures and alternatives for implementing them. Moreover, the student is able to design and implement algorithms and data structures.

Contents:

Data structures, algorithms, complexity.

Mode of delivery:

Web-based teaching and face-to-face teaching.

Learning activities and teaching methods:

20 h lectures; 10 h laboratory exercises; the rest as independent work.

Target group:

Computer Science and Engineering students and other Students of the University of Oulu.

Prerequisites and co-requisites:

Required: "521141P Elementary Computing" or a course with similar learning outcomes; recommended: "031023P Mathematical Structures for Computer Science".

Recommended optional programme components:

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

Recommended or required reading:

Will be announced at the beginning of the course.

Assessment methods and criteria:

Students answer questions after each lecture and do the laboratory exercises and the final exercise. Assessment is based on these three elements; passing the course requires points from each element. More detailed information on assessment can be found from http://www.oulu.fi/cse/studying/courses. 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:

Susanna Pirttikangas

Working life cooperation:

None.

521145A: Human-Computer Interaction, 5 op

Voimassaolo: 01.08.2012 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Computer Science and Engineering
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: English

Timing:

Autumn, periods 2-3

Learning outcomes:

Upon completing the course the student is able to explain the Human Computer Interaction (HCI) fundamentals, explain evaluation and prototyping techniques, explain how HCI can be incorporated in the software development process.

Contents:

Human and computer fundamentals, design and prototyping, evaluation techniques, data collection and analysis.

Mode of delivery:

Face to face teaching.

Learning activities and teaching methods:

Lectures (20 h), exercises (20 h), and practical work (95 h). The course is passed with an approved practical work. The implementation is fully English.

Target group:

Computer Science and Engineering students and other Students of the University of Oulu.

Prerequisites and co-requisites:

None. No prior courses are required.

Recommended optional programme components:

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

Recommended or required reading:

All necessary material will be provided by the instructor.

Assessment methods and criteria:

The assessment is project-based. Students have to complete three group-based activities throughout the semester: design & prototyping (40%), conduct an evaluation (40%), and complete a report of the activities (20%). Passing criteria: all 3 elements (designs, evaluation, report) must be completed, each receiving more than 50% of the available points.
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:

Vassilis Kostakos

521150A: Introduction to Internet, 5 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Electrical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Ojala, Timo Kullervo

Opintokohteen kielet: Finnish

ECTS Credits:

5

Language of instruction:

All materials are in English, lectures are given in Finnish.

Timing:

Spring, periods 4-5.

Learning outcomes:

Upon completing the course the student is able to explain the structure of the public Internet and the TCP/IP protocol stack, solve simple Internet problems, and design and implement a small Internet application.

Contents:

Internet's design principles and architecture, TCP/IP protocol stack, most important access networks, most important Internet applications, basics of Internet security.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 32 h / problem solving exercises 12 h / laboratory exercises 12 h / course work 25 h / self-study 52 h. Problem solving exercises, laboratory exercises and course work are completed as group work.

Target group:

Computer Science and Engineering students and other Students of the University of Oulu.

Prerequisites and co-requisites:

None.

Recommended optional programme components:

-

Recommended or required reading:

Will be announced at the beginning of the course.

Assessment methods and criteria:

The course uses continuous assessment so that there are 4 intermediate exams. Alternatively, the course can also be passed with a final exam. The course includes a mandatory course work.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

The course uses numerical grading scale 1-5.

Person responsible:

Professor Timo Ojala.

Working life cooperation:

-

521467A: Digital Image Processing, 5 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Computer Science and Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Esa Rahtu

Opintokohteen kielet: Finnish

Leikkaavuudet:

    ay521467A   Digital Image Processing (OPEN UNI)   5.0 op

ECTS Credits:

5

Language of instruction:

Lectures in Finnish and exercises in English. Course can be passed in Finnish and English.

Timing:

Autumn, periods 1-3.

Learning outcomes:

After completing the course the student understands the basic theory of digital image processing and knows its main applications. He is able to apply spatial and frequency domain and wavelet based methods in image enhancement, restoration, compression, segmentation and recognition.

Contents:

This course provides an introduction to digital image processing and machine vision. Topics: 1.Introduction, 2.Image enhancement, 3.Image restoration,
4. Color image processing, 5. Wavelets, 6. Image compression,7. Morphological image processing, 8. Image segmentation, 9. Representations and descriptions, 10. Pattern recognition.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 25 h, exercises 7 h and Matlab design exercises 25 h. The rest as independent work.

Target group:

Computer Science and Engineering students and other Students of the University of Oulu.

Prerequisites and co-requisites:

None.

Recommended optional programme components:

In order to obtain deep understanding of the content, it is a benefit if the student has completed the first year mathematic courses in the computer science and engineering BSc program or otherwise has equivalent knowledge.

Recommended or required reading:

Gonzalez, R.C., Woods, R.E.: Digital Image Processing, Second Edition, Addison-Wesley, 2002 (see course website: http://www.ee.oulu.fi/research/imag/courses/dkk/). Lecture notes and exercise material.

Assessment methods and criteria:

The course is passed by a final exam and programming 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:

Matti Pietikäinen, 2013 Esa Rahtu

Working life cooperation:

None.

Compulsory

521467A-01: Digital image processing, exam, 0 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Intermediate Studies

Laji: Partial credit

Vastuuyksikkö: Department of Computer Science and Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Esa Rahtu

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

521467A-02: Digital image processing, Exercise work, 0 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Intermediate Studies

Laji: Partial credit

Vastuuyksikkö: Department of Computer Science and Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Esa Rahtu

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

521484A: Statistical Signal Processing, 5 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Computer Science and Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Heikkilä, Janne Tapani

Opintokohteen kielet: Finnish

Leikkaavuudet:

521348S   Statistical Signal Processing 1   5.0 op

ECTS Credits:

5

Language of instruction:

Finnish, Course can be passed in English.

Timing:

Spring, periods 4-6.

Learning outcomes:

Upon completion of the course, the student is able to utilize the generic linear model as a representation for parameter estimation. He can apply typical deterministic and random parameter estimation methods for different estimation problems. He is able to determine statistical properties of estimators and make comparisons between them. The student can also form a basic state-variable model and utilize Kalman filtering for state estimation. Moreover, he is able to apply basic methods of detection theory for solving simple detection problems. After the course, the student can implement the learned methods and assess their statistical properties with the Matlab software.

Contents:

This course provides basic knowledge of statistical signal processing, in particular, estimation theory and its applications in signal processing. Topics: 1. Introduction, 2. Modeling of estimation problems, 3. Least Squares estimation, 4. BLUE-estimation, 5. Signal detection, 6. ML estimation, 7. MS estimation, 8. MAP estimation, 9. Kalman Filter.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures (30 h), exercises (24 h) and Matlab design exercise (10 h). The rest as independent work.

Target group:

Computer Science and Engineering students and other Students of the University of Oulu.

Prerequisites and co-requisites:

031019P Matrix Algebra, 031021P Probability and Mathematical Statistics

Recommended optional programme components:

521337A Digital Filters, 031050A Signal Analysis. These courses provide complementary information on digital signal processing and stochastic signals. The courses are recommended to be studied either in advance or simultaneously.

Recommended or required reading:

J. Mendel: Lectures in estimation theory for signal processing, communications and control, Prentice-Hall, 1995. M.D. Srinath, P.K. Rajasekaran, R. Viswanathan: Introduction to Statistical Signal Processing with Applications, Prentice-Hall, 1996, Chapter 3. Lecture notes and exercise material.

Assessment methods and criteria:

The course is passed with intermediate exams or final exam and accepted Matlab 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:

Janne Heikkilä

Working life cooperation:

None.

521495A: Artificial Intelligence, 5 op

Voimassaolo: 01.08.2012 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Computer Science and Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Esa Rahtu
Opintokohteen kielet: English
Leikkaavuudet:

　　ay521495A　　Artificial Intellig (OPEN UNI)　　5.0 op

ECTS Credits:

5

Language of instruction:

In Finnish. The exam and coursework can be passed in English.

Timing:

Periods 4-5.

Learning outcomes:

After taking the course, the student is able to identify the types of problems that can be solved using methods of artificial intelligence. The student knows the basic concepts of intelligent agents, the common search methods used in artificial intelligence, logic based reasoning and applying planning techniques to problems of artificial intelligence. The student can also apply simple methods to reasoning under uncertainty and machine learning from observation. In addition the student will be able to implement the most common search methods.

Contents:

1. Introduction, 2. Intelligent agents, 3. Solving problems by searching, 4. Informed search and exploration, 5. Constraint satisfaction problems, 6. Games, 7. Logical agents, 8. First-order logic, 9. Inference in first-order logic, 10. Planning, 11. Uncertainty, 12. Bayesian Networks, 13. Learning from observation.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

25 hours of lectures and a programming exercise (approximately 25 hours) during periods 4-5, the rest as independent work.

Target group:

Computer Science and Engineering students and other Students of the University of Oulu.

Prerequisites and co-requisites:

Programming skills.

Recommended optional programme components:

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

Recommended or required reading:

Primary text book and slides (in English): Russel S., Norvig P.: Artificial Intelligence, A Modern Approach (AIMA), Second Edition, Prentice Hall, 2003. Lecture notes (in Finnish): Syrjänen, M.: Tietämystekniikan peruskurssin luentomoniste, Teknillinen korkeakoulu, 2004. More details on the course WWW page http://www.ee.oulu.fi/research/imag/courses/ai/.

Assessment methods and criteria:

The course is passed with a final exam and a passed programming exercise.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

1-5 / fail.

Person responsible:

Professor Matti Pietikäinen, 2013 Esa Rahtu.

Working life cooperation:

-

812346A: Object Oriented Analysis and Design, 6 op

Voimassaolo: 01.08.2011 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Information Processing Science
Arvostelu: 1 - 5, pass, fail
Opettajat: Iisakka, Juha Veikko
Opintokohteen kielet: Finnish

ECTS Credits:

6 ECTS credits/160 hours of work

Language of instruction:

Finnish

Timing:

2nd year, autum semester, period 1

Learning outcomes:

After completing the course, the students know possibilities of UML-language family to describe different views. They can picture a task using Use cases and scenarios. Moreover they can produce detailed descriptions using activity-, class-, interaction- and state diagrams. They know principles of object-orientedness and can use abstract as well interface classes. Additionally they can model user interface by state diagrams.
They understand what design patterns are and how they are described and categorised.

Contents:

Principles of object orientation and object-oriented programming; quality criteria of object orientation; design patterns; case use; activity, class, interaction and state machine diagrams; class realisation.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 34h, compulsory exercises and assignments 30h, independent work 96h.

Prerequisites and co-requisites:

Basic knowledge of programming and information systems analysis and design.

Recommended optional programme components:

Recommended or required reading:

Bennet, McRobb & Farmer: Object-oriented systems analysis and design, Using UML

Assessment methods and criteria:

Assessment methods and criteria: Refer to course website
Read more about assessment criteria at the University of Oulu webpage.

Grading:

1-5

Person responsible:

Juha Iisakka

Working life cooperation:

No

555200A: Bachelor's Thesis / Industrial Engineering and Management, 8 op

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

ECTS Credits:
8 ECTS credits.
Language of instruction:
Finnish, the report can be done in English.
Timing:
Periods 1-6.

Learning outcomes:
The objective of the course is to familiarize students to research work. After the course, the students will be able to solve small problems of organizations by himself / herself. This means that the student is able to prepare a study plan, including defining research problem and research questions, and follow the plan. The student is able to critically use different kind of references. The student is able to draw up a report based on given instructions.

Contents:
Research methods of IEM.

Mode of delivery:
Seminar in autumn/spring.

Learning activities and teaching methods:
Seminar in autumn/spring, including lectures, group work and individual work.

Target group:
Industrial engineering and Management students.

Prerequisites and co-requisites:
555210A Training.

Recommended optional programme components:
-

Recommended or required reading:
Kauranen Ilkka; Mustakallio, Mikko; Palmgren, Virpi. Tutkimusraportin kirjoittamisen opas opinnäytetyön tekijöille - 2. korj. p. 2007 Teknillinen korkeakoulu; Kirjasto Espoo, 2006. - 109 s.   Kustantaja: Teknillinen korkeakoulu ISBN 951-22-8359-X UDK: 001.818; Hirsjärvi, Sirkka, Remes, Pirkko & Sajavaara, Paula: Tutki ja kirjoita. Tammi 2003, Helsinki.

Assessment methods and criteria:
Bachelor's thesis, presentation of the thesis and a maturity test.
Read more about assessment criteria at the University of Oulu webpage.

Grading:
Approved/not approved

Person responsible:
Kari Kisko, Aila Auvinen

Working life cooperation:
No

Other information:
-

555211A: Maturity Test / Industrial Engineering and Management, 0 op

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

    555202A   Maturity Test / Bachelor of Science in Industrial Engineering and Management   0.0 op

Ei opintojaksokuvauksia.

900061A: Scientific Communication for Production Engineering and Management, 2 op

Voimassaolo: 01.08.2008 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Language Centre

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Proficiency level:
-

Status:
Compulsory for the students undertaking the bachelor's degree in the Industrial Engineering and Management.

Required proficiency level:

-
ECTS Credits:
2 credits
Language of instruction:
Finnish
Timing:
The course begins in the first year of studies by introductory lessons and continues during the second or the third year of studies.
Learning outcomes:
The student should have mastered the basics of scientific communication. He/she should be able to view scientific writing as a process and prepare a scientific research report (among other scientific texts).
Contents:
Practises and distinctive features of scientific communication, writing as a process, critical and analytical reading strategies, style and language of science, essential questions of language planning.
Mode of delivery:
Multimodal teaching
Learning activities and teaching methods:
Introductory lessons 2 hrs, guiding in small gorups 3 hrs, distance teaching and independent study 49 hrs.
Target group:
Students undertaking the bachelor's degree in the Industrial Engineering and Management.
Prerequisites and co-requisites:
-
Recommended optional programme components:
The course is to be taken concurrently with the course 555210A Harjoittelu offered by the Department of Industrial Engineering and Management.
Recommended or required reading:
Material in Optima
Assessment methods and criteria:
Active participation in contact and distance teaching, independent study and completion of given assignments. Read more about assessment criteria at the University of Oulu webpage.
Grading:
Pass / fail
Person responsible:
Outi Mikkola
Working life cooperation:
Along with the course 555210A that includes practical training.
Other information:
-

A440171: Optional Studies, Bachelor of Science (Industrial Engineering and Management), 0 - 20 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Optional Studies

Laji: Study module

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

Tutkintorakenteisiin kuulumattomien opintokokonaisuuksien ja -jaksojen kuvaukset

555360S: Administration, Organization and Education in Working Life, 5 op

Opiskelumuoto: Advanced Studies
Laji: Course

Arvostelu: 1 - 5, pass, fail
Opettajat: Kisko, Kari Juhani
Opintokohteen kielet: English
Leikkaavuudet:

555371S   Human Resource Management   5.0 op

555376S   Organisational development   5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
5 ECTS credits.
Language of instruction:
Finnish, English
Timing:
Pperiods 4-6.
Learning outcomes:
The student can recognize factors influencing the actions of an individual within an organization and analyze the observed modes of acting. He/she is able to recognize new improvement areas and provide improvement suggestions according to the model of learning organization. The student is able to present his/her learnings to others and to evaluate the presentations of others. He/she is able to observe, analyze and make improvement suggestions regarding the complex interactions of organizations and their personnel.
Contents:
To provide information on organizations, human resource matters and the planning and development of an organization.
The mission and functions of an organization. Classical and modern organizational theories, esp. learning organization. Organizational culture. Management, especially HR management. Managing change of organizations and human resource matters in an organization. Organizational development.
Mode of delivery:
Contact teaching.
Learning activities and teaching methods:
Lectures, exercises, seminars and examination or only examination.
Target group:
-
Prerequisites and co-requisites:
-
Recommended optional programme components:
-
Recommended or required reading:
Sarala, U. & Sarala, A. Oppiva organisaatio - oppimisen, laadun ja tuottavuuden yhdistäminen. 8. painos. Palmenia-kustannus, 2003. Hatch, M. J. Organization Theory. Oxford University Press, New York, USA, 2006 ja muu opintojaksolla ilmoitettava kirjallisuus. Täydentävä materiaali: Haatanen: Työsuhde-politiikka. Julk. 895, Otatieto, Helsinki 2001.
Assessment methods and criteria:
continuous assessments; lectures, exercises, seminars and examination or only examination.
Read more about [assessment criteria](#) at the University of Oulu webpage.
Grading:
Numerical 1-5/fail.
Person responsible:
Lecturer Kari Kisko.
Working life cooperation:
No.
Other information:
-

555311S: Advanced Internship, 3 op

Voimassaolo: 01.01.2008 -
Opiskelumuoto: Advanced Studies
Laji: Practical training
Arvostelu: 1 - 5, pass, fail

Opettajat: Eija Forsberg

Opintokohteen kielet: Finnish

Leikkaavuudet:

555304S   Advanced Internship   5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
3 ECTS credits.
Language of instruction:
Finnish, the report can be written in English.
Timing:
Periods 1-6.
Learning outcomes:
During the course students learn to observe his/her working environment from the theoretical viewpoints of Industrial Engineering and Management (IEM). From the working environment, the student is able to specify a research problem related to IEM themes. The student is able to describe the problem or its solution by building a model, a process description, chart, etc. The student is able to critically use different kind of references related to the topic. The student is able to draw up a report based on given instructions.
Contents:
To be defined by each student.
Mode of delivery:
Students will write a report concerning summer job. The length of the summer job has to be 2 months minimum.
Learning activities and teaching methods:
Students will write a report concerning summer job. Student adviser will review and grade the report.
Target group:
Industrial engineering and Management students.
Prerequisites and co-requisites:
555210A Internship, 555200A Bachelor's Thesis.
Recommended optional programme components:
-
Recommended or required reading:
To be defined by each student.
Assessment methods and criteria:
Written report.
Read more about [assessment criteria](#) at the University of Oulu webpage.
Grading:
Approved/not approved.
Person responsible:
Student adviser
Working life cooperation:
Yes
Other information:
-

721704P: Business Logistics, 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Oulu Business School

Arvostelu: 1 - 5, pass, fail

Opettajat: Jari Juga

Opintokohteen kielet: English

Leikkaavuudet:

ay721704P   Business Logistics (OPEN UNI)   5.0 op

721704A   Business Logistics   5.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work.
Language of instruction:
English.

Timing:
Autumn semester/ period B.

Learning outcomes:
The student recognizes how logistics contributes to business competitiveness and is able to specify central planning principles in logistics management. The student can describe interdependencies between logistics activities and solve basic problems in materials management and inventory control.

Contents:
Topics include logistics tradeoffs, logistics service level, transport and inventory management, logistics performance, basic production planning and order scheduling, just-in-time logistics, and green logistics.
Mode of delivery:
Face-to-face teaching.
Learning activities and teaching methods:
Lectures (30 h), including basic calculations and exercises in class. Independent reading of course literature (73 h) and self-study of calculation problems (30 h).
Target group:
Bachelor-level students.
Prerequisites and co-requisites:
-
Recommended optional programme components:
This study unit is also offered in the Open University (lectures in Finnish).
Recommended or required reading:
Jonsson, P. (2008), Logistics and Supply Chain Management, McGraw-Hill with supplementary study material in specified during lectures.

Check availability from here.
Assessment methods and criteria:
Exam (course book, lectures, basic calculation problems).
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 Jari Juga.

Working life cooperation:
-
Other information:
-

555368S: Contemporary Ergonomics, 3 op

Opiskelumuoto: Advanced Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Seppo Väyrynen
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

470460A: Controls and Systems Engineering Fundamentals, 5 op

Voimassaolo: - 31.07.2010

Opiskelumuoto: Intermediate Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Kortela, Urpo, Seppo Honkanen

Opintokohteen kielet: Finnish

Leikkaavuudet:

477602A   Control System Analysis   4.0 op

Ei opintojaksokuvauksia.

555363S: Creativity at Work and in Product Development, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Kisko, Kari Juhani

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay555363S   Creativity at Work and in Product Development (OPEN UNI)   5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
5 ECTS credits.
Language of instruction:
Finnish
Timing:
Periods 1-2.
Learning outcomes:
Upon completion the student is able to observe his/her surroundings and recognize development targets. He/she is able to analyze these observations and apply previous knowledge and skills to create new solutions. He/she is able to produce new product ideas and ways of work and to recognize their linkages and effects. He/she learns to present his finding using field specific terms. The student is able to apply the principles of learning organization and continuous development.
Contents:
Creation interest in seeing development ideas related to work communities. To give methods for the realization of these ideas. Introduction to creativity, application of creative work techniques in groupwork cases, a large scale development initiative groupwork and a results seminar. The subjects are mostly linked to practical working life.
Mode of delivery:
Contact teaching.
Learning activities and teaching methods:
Lectures, exercises, group works and seminars.
Target group:
-
Prerequisites and co-requisites:
-
Recommended optional programme components:
-
Recommended or required reading:
Luova työote - tuottava työ- Työhallinnon julkaisu 345. Työministeriö 2005.; Rajala, H-K. ja Kisko, K. 2005. Yhdessä paja paremmaksi. Teknologiateollisuus ry. 86 s. Langford, J. ja McDonagh, D. (Toim.) 2003. Focus Groups - Supporting Effective Product Development. London: Taylor & Francis. 230 s. Other literature is announced during the course.
Assessment methods and criteria:
Continuous assessment; lectures, exercises, group works and seminars.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Numerical 1-5/fail
Person responsible:

Lecturer Kari Kisko.
Working life cooperation:
No.
Other information:
-

555325S: Human Resources Management, 3 op

Voimassaolo: - 31.07.2012
Opiskelumuoto: Advanced Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Kess, Pekka Antero
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

Language of instruction:
Finnish
Learning outcomes:
Learning outcomes: After completing the course student knows the key concepts of human resource management and can explain these. The student can describe the structures of human resource organizations and can explain the meaning of management in the performance of human resource management. The student can analyse the human resources activities in a company and can produce improvement proposals based on the analysis. After the course the student can take part in the human resources management development in the role of an expert.
Contents:
People Capability Maturity Model
Target group:
Main target groups are the Students of Industrial Engineering and Management as well as those students in the departments of Mechanical Engineering and Process and Environmental Engineering who have the orientation to Industrial Engineering and Management. Other engineering students are accepted.
Recommended or required reading:
Curtis B, Hefley H & Miller S. (2002)   The People Capability Maturity Model. Guidelines for Improving the Workforce. SEI Series. Management of Human Resources. Garnegie Mellon. Software Engineering Institute. Pearson Education, Lecture notes, Other material will be informed during the lectures.
Assessment methods and criteria:
Course is completed and assessed by team work report and its presentation in the closing seminar .
Read more about assessment criteria at the University of Oulu webpage.

521319A: Introduction to Telecommunication Engineering, 2,5 op

Voimassaolo: 01.08.2006 - 31.07.2012
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Juha-Pekka Mäkelä
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

521481P: Introduction to the Use of Workstation, 1 op

Voimassaolo: - 31.07.2012
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Department of Computer Science and Engineering

Arvostelu: 1 - 5, pass, fail
Opettajat: Toni Hakanen
Opintokohteen kielet: English

Ei opintojaksokuvauksia.

724110P: Introductory Economics, 5 op

Voimassaolo: 01.08.2014 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Oulu Business School
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

   ay724110P   Introductory Economics (OPEN UNI)   5.0 op

   721211P   Principles of Economics   10.0 op

   721210P   Principles of Economics   5.0 op

Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

724105P: Management Accounting, 5 op

Voimassaolo: 01.08.2014 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Oulu Business School
Arvostelu: 1 - 5, pass, fail
Opettajat: Janne Järvinen
Opintokohteen kielet: Finnish
Leikkaavuudet:

   ay724105P   Management Accounting (OPEN UNI)   5.0 op

   721172P   Management Accounting   5.0 op

Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

555342S: Operations Research, 5 op

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

   555332S   Operations and supply network analytics   5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
5 ECTS credits.

Language of instruction:
Finnish
Timing:
Periods 4-6.
Learning outcomes:
After this study module, a student is capable of applying quantitative methods typical to the field of industrial engineering and management. The student will also be capable of defining development plans for production processes by using these methods.
Contents:
Mathematical methods typical for operations research. These methods include multivariate analysis for decision making and simulation.
Mode of delivery:
Lectures and compulsory course work.
Learning activities and teaching methods:
Lectures and compulsory course work.
Target group:
Industrial engineering and management students.
Prerequisites and co-requisites:
Bachelor in industrial engineering and management
Recommended optional programme components:
-
Recommended or required reading:
handouts, course work, and a collection of articles
Assessment methods and criteria:
Final exam.
Read more about [assessment criteria](#) at the University of Oulu webpage.
Grading:
1-5
Person responsible:
Professor Harri Haapasalo
Working life cooperation:
No
Other information:
-

721409P: Principles of Marketing, 5 op

Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Oulu Business School
Arvostelu: 1 - 5, pass, fail
Opettajat: Salo, Jari Tapani
Opintokohteen kielet: Finnish
Leikkaavuudet:

ay721409P   Principles of Marketing (OPEN UNI)   5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
5 ECTS credits / 138 hours of work

Language of instruction:
Finnish.

Timing:
Autumn semester/Period A.

Learning outcomes:

Upon completion of this course, students should be able to 1) understand the basic concepts of marketing, 2) identify different context for marketing and use marketing concepts for favorable outcomes 3) identify PEST and other issues influencing marketing activities and markets 4) understand marketing as a process starting from planning and ending to control / management of the process.

Contents:
During the course, following themes will be discussed: 1) marketing as science and practice, 2) definitions of marketing 3) marketing strategy and analysis, 4) marketing mix, 5) segmenting, targeting and positioning, 6) marketing in different contexts, 7) market analysis and new product/service/idea/solution development, 8) distribution, 9) planning, implementation and control of marketing process

Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
30 hours of lectures, exam (4 h), independent reading of the textbook and articles (54 h), exercises (50 h).

Target group:
Students who are studying marketing as a major or minor subject.
Prerequisites and co-requisites:
-
Recommended optional programme components:
-
Recommended or required reading:
Kotler, P & Armstrong, G. (2013), Principles of marketing, 15 th ed.

Check availability from here.
Assessment methods and criteria:
Examination 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:
Professori Jari Salo

Working life cooperation:
-
Other information:
The number of students is limited to 200 enrolled students. Marketing students are selected first and then course is filled up to 200.

724106P: Principles of Marketing, 5 op

Voimassaolo: 01.08.2014 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Oulu Business School

Arvostelu: 1 - 5, pass, fail

Opettajat: Salo, Jari Tapani

Opintokohteen kielet: Finnish

Leikkaavuudet:

   ay724106P   Principles of Marketing (OPEN UNI)   5.0 op

   ay721409P   Principles of Marketing (OPEN UNI)   5.0 op

   721409P   Firm in the Network Contexts   5.0 op

Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

555286A: Process and quality management, 5 op

Voimassaolo: 01.01.2014 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

ay555286A   Process and quality management (OPEN UNI)   5.0 op

555281A   Basic Course of Quality Management   5.0 op

Ei opintojaksokuvauksia.

555343S: Product Data and product life cycle management, 5 op

Opiskelumuoto: Advanced Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Arto Tolonen
Opintokohteen kielet: English
Voidaan suorittaa useasti: Kyllä

ECTS Credits:
5 ECTC credits.
Language of instruction:
English
Timing:
Periods 4-6.
Learning outcomes:
The course familiarizes a student with the product processes of an enterprise and specifically the meaning of product data in different stages of product process. After finishing the course, a student knows what product data is and how it can be used for business purpose. A student is familiar with the basic concepts of product data management (PDM) and is aware of the basic tools used for PDM. After finishing the course, a student will able to analyze existing and future products from product structure viewpoint. Students will be able to analyze the company's product data management as a whole and to give suggestions based their analysis.
Contents:
Product information management concepts, its history and challenges, PDM-processes: managing product models, managing documents and configurations as well as tracing information, PDM-system and its functions, PDM-project and implementation of the system.
Mode of delivery:
Face-to-face teaching.
Learning activities and teaching methods:
Lectures, group work, exam.
Target group:
Industrial engineering and management students
Prerequisites and co-requisites:
555240S Basic course in product development.
Recommended optional programme components:
-
Recommended or required reading:
Lecture materials and selected articles. Saaksvuori A & Immonen A. (2008) Product lifecycle management, 8 ed. pages 1-65 and 91-176.
Assessment methods and criteria:
Group work report and exam.
Read more about [assessment criteria](#) at the University of Oulu webpage.
Grading:
1-5

Person responsible:
Professor Harri Haapasalo
Working life cooperation:
No
Other information:
-

521024A: Programmable Electronics, 5 op

Voimassaolo: 01.08.2005 - 31.07.2014

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Department of Electrical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Antti Mäntyniemi

Opintokohteen kielet: Finnish

ECTS Credits:
5
Language of instruction:
In Finnish.
Timing:
Period 1-3.
Learning outcomes:
Upon completing the required coursework, the student is able to analyse the operation of a simple digital device and to formulate a design specification document. The student is also able to formulate a design document of a simple digital system and based on that to describe the behaviour of a digital system with VHDL-language and to implement the device with an FPGA-circuit.
Contents:
Design specification, logic design, VHDL-language, logic simulation, logic synthesis, FPGA-programming.
Mode of delivery:
Introductory lecture and design exercise.
Learning activities and teaching methods:
The course is based on an introductory lecture and collaborative exercises. The course consists of three subtasks. In the first task the structure and operation of a digital device is analysed and documented. The result of the task is a design specification. In the second task a Register Transfer Level description following the design specification is designed. In the third task the behaviour of the logic is described using VHDL-language and the operation of the logic is verified with logic simulator software and tested in practice with a programmable logic device. The course is passed by accepted and documented exercises.
Target group:
-
Prerequisites and co-requisites:
Digital Techniques I and Computer Engineering.
Recommended optional programme components:
-
Recommended or required reading:
Instruction site in Optima, example documents and Altera DE0/DE2 User Manual.
Assessment methods and criteria:
The design documents are audited in phases. The designed device is tested with the instructor.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Pass/failed.
Person responsible:
Antti Mäntyniemi.
Working life cooperation:
-
Other information:
-

555283A: Project Communication, 3 op

Voimassaolo: - 31.07.2012
Opiskelumuoto: Intermediate Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Jokinen, Tauno Jaakko
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

Language of instruction:
Finnish
Learning outcomes:
Upon completion the student should be able to:
Apply the concepts of effective communications in project environment
Learning activities and teaching methods:
Lectures, exercises learning report
Assessment methods and criteria:
The assessment is based on learning report
Read more about assessment criteria at the University of Oulu webpage.

555380S: Quality Management, 5 op

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

   555390S   Process Analytics   5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
5 ECTS credits.
Language of instruction:
English
Timing:
Periods 5-6.
Learning outcomes:
Having completed the course, the student can analyse the central principles and contents of quality management and related management approaches. The student can apply the learned things and methods in different kinds of situations and industries.
Contents:
Quality management and its basic assumptions, the methods of TQM in different environments, process management, quality systems, quality award competitions, Six Sigma, performance measurement, Lean, organisational capability models.
Mode of delivery:
Face-to-face learning.
Learning activities and teaching methods:
Lectures, a personal exercise, a group study and an exam.
Target group:
Undergraduate students of IEM.
Prerequisites and co-requisites:
-
Recommended optional programme components:
555281A Basic course in quality management
Recommended or required reading:
Lecture materials and selected articles.

Assessment methods and criteria:
The course grade is derived from the exam score, group work grade and the personal exercise grade.
Read more about [assessment criteria](#) at the University of Oulu webpage.
Grading:
1-5.
Person responsible:
Osmo Kauppila
Working life cooperation:
No
Other information:
The course gives the student a broad conception of contents of total quality management and applying it in different environments.

555348S: Research project in product development management, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Haapasalo, Harri Jouni Olavi

Opintokohteen kielet: English

Leikkaavuudet:

555379S   Research Project in Industrial Engineering and Management   5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
5 ECTS credits. It is also possible to complete the course as a broader work piece of more than 5 ECTS credits if agreed so with the instructor.
Language of instruction:
English
Timing:
Periods 1-6.
Learning outcomes:
After finishing the course, the student will able to analyze and develop company activities using product development management methods.
Contents:
Completion of the course is agreed on one-to-one with the instructor. An accepted completion of the work requires planning of a research plan, familiarization with related literature, presented a solution to the researched question, and a written report.
Mode of delivery:
Will be defined at the beginning of the course.
Learning activities and teaching methods:
Will be agreed together with the student and the professor.
Target group:
Industrial engineering and management students.
Prerequisites and co-requisites:
555340S Technology management, 555321S Risk management, 555320S Strategic management.
Recommended optional programme components:
-
Recommended or required reading:
Will be defined at the beginning of the course.
Assessment methods and criteria:
Will be defined at the beginning of the course.
Read more about [assessment criteria](#) at the University of Oulu webpage.
Grading:
Will be defined at the beginning of the course.
Person responsible:
professor Harri Haapasalo
Working life cooperation:
No
Other information:

-

555321S: Risk Management, 3 op

Opiskelumuoto: Advanced Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Hanna Kropsu-Vehkaperä

Opintokohteen kielet: English

Leikkaavuudet:

   555377S   Risk Management   5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
3 ECTS credits.
Language of instruction:
English
Timing:
Periods 1-3.
Learning outcomes:
The course familiarizes a student with the overall concept of risk management. After completing the course student can explain the key concepts of risk management. The student can describe risk classifications and can explain the importance of the risk management to organisations. The student can analyse business risks from new points of view and can produce improvement proposals based on the risk analysis.
Contents:
Theoretical definition of risks, risks in entrepreneurship and their classifications, methods of risk management, tools for corporate risk management.
Mode of delivery:
Face-to-face teaching.
Learning activities and teaching methods:
Lectures, individual work or group work.
Target group:
Industrial engineering and management students.
Prerequisites and co-requisites:
B.Sc. in Industrial Engineering and Management or equivalent.
Recommended optional programme components:
-
Recommended or required reading:
Bernstein P.L. (1996) Against the Gods - The Remarkable Story of Risk. JohnWiley & Sons Inc., ISBN: 0-471-29563-9 (nid.), 0-471-12104-5 (sid.); Lecture materials.
Assessment methods and criteria:
Group work (/exam).
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1-5
Person responsible:
Professor Pekka Kess.
Working life cooperation:
No
Other information:
-

555347S: Seminar in product development management, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Haapasalo, Harri Jouni Olavi

Opintokohteen kielet: English
Leikkaavuudet:

555378S   Seminar in industrial engineering and management   5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
5 ECTS credits.
Language of instruction:
English
Timing:
Periods 1-3.
Learning outcomes:
After finishing the course, the student will able to present research areas related to product development management. The student will also able to assess related research and to critically discuss it.
Contents:
Each seminar session discusses a certain topic in product development management in great detail. The topic area is specified according to students' wishes. On top of lectures the course includes completion of a personal research report.

Mode of delivery:
Will be defined at the beginning of the course.
Learning activities and teaching methods:
Will be defined at the beginning of the course. Students may also propose topics for the seminar. Lectures and seminar sessions are compulsory in order to complete the course.
Target group:
Industrial engineering and management students.
Prerequisites and co-requisites:
555340S Technology management, 555321S Risk management, 555320S Strategic management.
Recommended optional programme components:
-
Recommended or required reading:
Will be defined at the beginning of the course.
Assessment methods and criteria:
Will be defined at the beginning of the course.
Read more about [assessment criteria] at the University of Oulu webpage.
Person responsible:
Professor Harri Haapasalo
Working life cooperation:
No
Other information:
-

555320S: Strategic Management, 5 op

Opiskelumuoto: Advanced Studies
Laji: Course
Arvostelu: 1 - 5, pass, fail
Opettajat: Jukka Majava
Opintokohteen kielet: English
Leikkaavuudet:

555370S   Strategic Management   5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
5 ECTS credits.
Language of instruction:
English.
Timing:

Periods 1-3.
Learning outcomes:
The aim of the course is to familiarize a student with strategic thinking as well as develop students' understanding of the complexity of global business operations, in both theory and practice. After completing the course student is familiar with strategic thinking, strategic management and strategic planning. The student has under-standing of the complexity of global business operations, and can participate in strategic planning in organizations. The student is familiar with strategy analysis frameworks and can analyze the implementation of chosen strategy.
Contents:
Strategic thinking, creation of strategic plan, strategy analysis frameworks and the basic types of strategy orientation for an enterprise, implementation of a business strategy in a dynamic, competitive environment with an on-line strategy simulation tool, analyzing the implementation of chosen strategy.
Mode of delivery:
Face-to-face teaching and group homework.
Learning activities and teaching methods:
Lectures, group work, final report and seminar.
Target group:
Industrial engineering and management students.
Prerequisites and co-requisites:
555322S Production management, B.Sc. in Industrial Engineering and Management or equivalent.
Recommended optional programme components:
-
Recommended or required reading:
Isoherranen, V. (2012) Strategy analysis frameworks for strategy orientation and focus, University of Oulu, Faculty of Technology, Department of Indus-trial Engineering and Management; Mintzberg, H. et al. (2009) Strategy safari: the complete guide through the wilds of strategic management, 2nd ed. Harlow, FT Prentice Hall.
Assessment methods and criteria:
Group work or exam.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1-5
Person responsible:
Professor Pekka Kess.
Working life cooperation:
No
Other information:
-

555340S: Technology Management, 4 op

Opiskelumuoto: Advanced Studies

Laji: Course

Arvostelu: 1 - 5, pass, fail

Opettajat: Haapasalo, Harri Jouni Olavi

Opintokohteen kielet: English

Leikkaavuudet:

   555350S   Research and Technology Management   5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:
4 ECTS credits.
Language of instruction:
English
Timing:
Periods 1-3.
Learning outcomes:
After finishing the course, the student will able to differentiate product development and technology management in a company. The student will be able to piece together the development needs and cycles of technologies in an organization. In addition, the student will know how to combine technology development and technology management with strategic planning of a company.
Contents:

The course consists of defining technology and its role within an enterprise and within society. During the course we study the meaning of innovation in technological competition. The lifecycles of technology including development, acquirement, and movement are also covered.

Mode of delivery:
Face-to-face teaching, exercises and group work done as homework.
Learning activities and teaching methods:
Lectures, exercises and group work.
Target group:
Industrial engineering and management students.
Prerequisites and co-requisites:
555240A Basic course in product development.
Recommended optional programme components:
-
Recommended or required reading:
Lecture materials and selected articles, will be defined at the beginning of the course.
Assessment methods and criteria:
Exam
Read more about assessment criteria at the University of Oulu webpage.
Grading:
1-5
Person responsible:
Professor Harri Haapasalo.
Working life cooperation:
No.
Other information:
-

813352A: Usability Testing, 5 op

Voimassaolo: 01.08.2011 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Department of Information Processing Science
Arvostelu: 1 - 5, pass, fail
Opettajat: Mikko Rajanen
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.