Opasraportti

FTEch - Mechanical Engineering (2020 - 2021)

University’s new study guide for academic year 2020-2021 is published at https://opas.peppi.oulu.fi

The study guide includes information on degrees, curriculums, courses and course timetables. Course registrations are still done in Oodi.

If you have questions on information in the study guide, please contact the study field's Academic Affairs Service Team https://www.oulu.fi/forstudents/faculty-study-affairs

Tutkintorakenteet

B.Sc., Mechanical Engineering

Tutkintorakenteen tila: published

Lukuvuosi: 2020-21

Lukuvuoden alkamispäivämäärä: 01.08.2020

Basic and Intermediate Studies, Mechanical Engineering (135 op)

A460120: Basic and Intermediate Studies, Mechanical Engineering, 109,5 - 120 op

e1

460083P: Orientation Course for New Students, 1 op
031010P: Calculus I, 5 op
031075P: Calculus II, 5 op
031076P: Differential Equations, 5 op
461101A: Mathematical Analysis in Mechanical Engineering, 5 op
761119P: Electromagnetism 1, 5 op
761310A: Wave motion and optics, 5 op
555225P: Basics of industrial engineering and management, 5 op
030005P: Information Skills, 1 op
465101A: Introduction to materials for mechanical engineering, 5 op
464101A: Machine drawing and CAD, 5 op
461102A: Statics, 5 op
461103A: Strength of materials I, 5 op
463101A: Introduction to manufacturing technology, 5 op
461104A: Strength of materials II, 5 op
461106A: Dynamics, 5 op
464102A: Design of machine elements, 10 op
461105A: Technical thermodynamics, 5 op
463102A: Manufacturing technology I, 5 op
465102A: Materials for mechanical engineering, 5 op

460020A: Basics of computing and programming in mechanical engineering, 5 op
462101A: Information technology and machines, 5 op
462103A: Introduction to Maintenance, 5 op
555265P: Occupational Safety and Health Management, 5 op
555285A: Project management, 5 op
460003A: Practical training I, 5 op
901045Y: Second Official Language (Swedish), Oral Skills, 1 op
901044Y: Second Official Language (Swedish), Written Skills, 1 op

e2

902147Y: Academic Vocabulary for Science and Technology, 2 op
902142Y: Business Correspondence, 2 op
902149Y: Mechanics of Writing, 2 op
903009P: Technical German, Elementary Course, 6 op
903010P: Technical German 1, 6 op
903012P: Technical German 3, 6 op
904054P: Technical Russian 1, 7,5 op

Module Preparing for the Option (35 op)

Automotive Engineering

A460121: Module Preparing for the Option, Automotive Engineering, 40 op

e3

461107A: Finite Element Methods I, 5 op
462102A: Machine automation actuators, 5 op
462104A: Machine automation, 5 op
462107A: Maintenance of machines, 5 op
464103A: Machine design, 5 op
464104A: Product innovations, 5 op
465104A: Heat treatment and welding of metals, 5 op

Machine Design

A460122: Module Preparing for the Option, Machine Design, 40 op

e4

462102A: Machine automation actuators, 5 op
464103A: Machine design, 5 op
464104A: Product innovations, 5 op
461107A: Finite Element Methods I, 5 op
462104A: Machine automation, 5 op
462107A: Maintenance of machines, 5 op
465104A: Heat treatment and welding of metals, 5 op

Materials Engineering

A460123: Module Preparing for the Option, Materials Engineering, 36 op

e5

462102A: Machine automation actuators, 5 op
465104A: Heat treatment and welding of metals, 5 op
465106A: Basics of corrosion in metals, 5 op
465105A: Research techniques for materials, 5 op
465103A: Principles of metal shaping and forming, 5 op
463105A: Casting techniques, 8 op

Mechatronics and Machine Diagnostics

A460124: Module Preparing for the Option, Mechactronics and Machine Diagnostics, 40,5 op

e6

462102A: Machine automation actuators, 5 op
462105A: Machine Sensor Technology, 5 op
462104A: Machine automation, 5 op
462106A: Precision engineering, 5 op

464103A: Machine design, 5 op
462107A: Maintenance of machines, 5 op
521141P: Elementary Programming, 5 op

Engineering Mechanics

A460126: Module Preparing for the Option, Engineering Mechanics, 37,5 op
e8
462102A: Machine automation actuators, 5 op
461107A: Finite Element Methods I, 5 op
461109A: Finite element methods II, 5 op
461108A: Mechanics of materials, 5 op
464103A: Machine design, 5 op
031022P: Numerical Analysis, 5 op

Manufacturing Technology

A460128: Module Preparing for the Option, Production Technology, 37 op
e10
462102A: Machine automation actuators, 5 op
463103A: Quality in production and dimensional measurements, 5 op
463104A: Advanced manufacturing methods, 7 op
463105A: Casting techniques, 8 op
465104A: Heat treatment and welding of metals, 5 op
462107A: Maintenance of machines, 5 op

Bachelor Thesis and Communication Studies (10 op)

A400075: Bachelor's Thesis and Seminar or Communication Studies, 10 op
Compulsory
900060A: Technical Communication, 2 op
469081A: Bachelor's Thesis / Mechanical Engineering, 8 op
469080A: The Maturity Test for BachelorŽs Degree, 0 op

M.Sc., Mechanical Engineering

Tutkintorakenteen tila: published

Lukuvuosi: 2020-21

Lukuvuoden alkamispäivämäärä: 01.08.2020

Modules of the Options (45 - 70 op)

Automotive Engineering

A460221: Module of the Option, Automotive Engineering, 39,5 op
e
464122A: Mobile hydraulics, 5 op
464121A: Automotive engineering principles, 5 op
464123S: Structural systems in automotive vehicles, 5 op
464125S: Automotive development project, 10 op
464124A: Internal combustion engines, 5 op
464126S: Machine dynamics of piston engines, 5 op
461112S: Mechanical vibrations, 5 op
460004S: Practical Training II, 5 op

Machine Design

A460222: Module of the Option, Machine Design, 40 op
en
464106S: Production machine design, Paper machinery, 10 op
464107S: Machine design project, 10 op
464105S: Computer aided design, 5 op
461112S: Mechanical vibrations, 5 op
461110S: Fluid mechanics, 5 op
462105A: Machine Sensor Technology, 5 op
460004S: Practical Training II, 5 op

Materials Engineering

A460223: Module of the Option, Materials Engineering, 40 op
e
465109S: Microstructural changes in metallic alloys, 7 op
465110S: Strength of metallic alloys, 7 op
465111S: Welding metallurgy, 8 op
465113S: Failure mechanisms in metals, 5 op
465107A: Introduction to physical metallurgy, 5 op
465112S: Sheet metal forming, 8 op
465108S: Modelling of metal forming processes, 5 op
465116S: Rolling technology, 10 op
465115S: Processing and properties of steels, 5 op
465114S: Exercises in physical metallurgy, 5 op
460004S: Practical Training II, 5 op

Mechatronics and Machine Diagnostics, Mechatronics

A460224: Module of the Option/Mechactronics and Machine Diagnostics, Mechatronics, 40 op
e
462108S: Mechatronics, 6 op
462109S: Simulation and modelling of machines, 8 op
462110S: Advanced course in mechatronics, 8 op
477621A: Control System Analysis, 5 op
461112S: Mechanical vibrations, 5 op
521301A: Digital Techniques 1, 8 op
460004S: Practical Training II, 5 op

Mechatronics and Machine Diagnostics, Machine Diagnostics

A460225: Module of the Option/Mechactronics and Machine Diagnostics, Machine Diagnostics, 41,5 op
eng
462111S: Machine diagnostics, 10 op
462112S: Measuring instruments in machine diagnostics, 5 op
461112S: Mechanical vibrations, 5 op
465113S: Failure mechanisms in metals, 5 op
521301A: Digital Techniques 1, 8 op
031077P: Complex analysis, 5 op
461107A: Finite Element Methods I, 5 op
460004S: Practical Training II, 5 op

Engineering Mechanics

A460228: Module of the Option, Engineering Mechanics, 40 op
engla
461113S: Finite element methods III, 5 op
461110S: Fluid mechanics, 5 op
461115S: Fracture mechanics, 5 op
461116S: Experimental methods in engineering mechanics, 5 op
461111S: Continuum mechanics, 5 op
461112S: Mechanical vibrations, 5 op
464106S: Production machine design, Paper machinery, 10 op

460004S: Practical Training II, 5 op

Production Technology

A460230: Module of the Option, Production Technology, 43,5 op
e
463107S: Manufacturing technology II, 20 op
463106S: Design and manufacture of sheet and plate metal products, 8 op
463109S: Computer aided manufacturing, 7 op
462104A: Machine automation, 5 op
460004S: Practical Training II, 5 op

Supplementary modules (20 - 35 op)

Automotive Engineering

A460246: Supplementary Module, Automotive Engineering, 20 op
e
462109S: Simulation and modelling of machines, 8 op
463105A: Casting techniques, 8 op
463104A: Advanced manufacturing methods, 7 op
463108S: Manufacturing technology II, 10 op
463106S: Design and manufacture of sheet and plate metal products, 8 op
465113S: Failure mechanisms in metals, 5 op
461108A: Mechanics of materials, 5 op
461109A: Finite element methods II, 5 op
461113S: Finite element methods III, 5 op
464108S: Advanced Topics on Machine Design, 5 - 10 op
555343S: Product Data and product life cycle management, 5 op
462111S: Machine diagnostics, 10 op
462112S: Measuring instruments in machine diagnostics, 5 op
464105S: Computer aided design, 5 op
462105A: Machine Sensor Technology, 5 op

Machine Design

A460247: Supplementary Module, Machine Design, 22 op
en
462109S: Simulation and modelling of machines, 8 op
463104A: Advanced manufacturing methods, 7 op
463105A: Casting techniques, 8 op
463108S: Manufacturing technology II, 10 op
463106S: Design and manufacture of sheet and plate metal products, 8 op
465113S: Failure mechanisms in metals, 5 op
461108A: Mechanics of materials, 5 op
461109A: Finite element methods II, 5 op
461113S: Finite element methods III, 5 op
464108S: Advanced Topics on Machine Design, 5 - 10 op
466105S: Design of Steel Structures, 6 op
466106S: Advanced topics on design of steel structures, 6 op
555343S: Product Data and product life cycle management, 5 op
462111S: Machine diagnostics, 10 op
462112S: Measuring instruments in machine diagnostics, 5 op

Mechatronics and Machine Diagnostics, Mechatronics

A460249: Supplementary Module/Mechactronics and Machine Diagnostics, Mechatronics, 20 op
eng
521287A: Introduction to Computer Systems, 5 op
521077P: Introduction to Electronics, 5 op
031077P: Complex analysis, 5 op
031080A: Signal Analysis, 5 op

521431A: Principles of Electronics Design, 5 op
521302A: Circuit Theory 1, 5 op
521150A: Introduction to Internet, 5 op
811312A: Data Structures and Algorithms, 5 op
477622A: Control System Design, 5 op
477502A: Experiment design and analysis, 5 op
477607S: Advanced Control and Systems Engineering, 5 op
477525S: Computational intelligence in automation, 5 op
462113S: Advanced topics on mechatronics and machine diagnostics, 5 - 10 op
464105S: Computer aided design, 5 op
464122A: Mobile hydraulics, 5 op
461107A: Finite Element Methods I, 5 op
555343S: Product Data and product life cycle management, 5 op

Mechatronics and Machine Diagnostics, Machine Diagnostics

A460250: Supplementary Module/Mechactronics and Machine Diagnostics, Machine Diagnostics, 20 op
e1
477525S: Computational intelligence in automation, 5 op
464106S: Production machine design, Paper machinery, 10 op
555330S: Sourcing Management, 5 op
461110S: Fluid mechanics, 5 op
477625S: Power Plant Automation, 5 op
465106A: Basics of corrosion in metals, 5 op
555286A: Process and quality management, 5 op
031080A: Signal Analysis, 5 op
461116S: Experimental methods in engineering mechanics, 5 op
521092A: Electronic Measurement Techniques, 5 op
521302A: Circuit Theory 1, 5 op
462113S: Advanced topics on mechatronics and machine diagnostics, 5 - 10 op
464105S: Computer aided design, 5 op
464122A: Mobile hydraulics, 5 op
461107A: Finite Element Methods I, 5 op
555343S: Product Data and product life cycle management, 5 op

Engineering Mechanics

A460253: Supplementary Module, Engineering Mechanics, 20 op
e2
461117S: Engineering optimization, 5 op
461114S: Mechanics of composites, 5 op
031051S: Numerical Matrix Analysis, 5 op
462109S: Simulation and modelling of machines, 8 op
462111S: Machine diagnostics, 10 op
462112S: Measuring instruments in machine diagnostics, 5 op
465113S: Failure mechanisms in metals, 5 op
465108S: Modelling of metal forming processes, 5 op
466105S: Design of Steel Structures, 6 op
466106S: Advanced topics on design of steel structures, 6 op
031025A: Introduction to Optimization, 5 op
464107S: Machine design project, 10 op
461118S: Advanced topics on engineering mechanics, 5 - 10 op

Production Technology

A460255: Supplementary Module, Production Technology, 20 op
e3
555286A: Process and quality management, 5 op
555330S: Sourcing Management, 5 op
555331S: Advanced Supply Chain Management, 5 op
555333S: Production Management, 5 op
555343S: Product Data and product life cycle management, 5 op
462111S: Machine diagnostics, 10 op

462112S: Measuring instruments in machine diagnostics, 5 op
464103A: Machine design, 5 op
462106A: Precision engineering, 5 op
463110S: Advanced topics on manufacturing technology, 5 - 10 op

Optional Studies (20 op)

Automotive Engineering

Machine Design

Materials Engineering

Mechatronics and Machine Diagnostics, Mechatronics

Mechatronics and Machine Diagnostics, Machine Diagnostics

Structural Engineering and Construction Tehcnology

Engineering Mechanics

Production Technology

Master's Thesis (30 op)

A400080: Master's Thesis and Maturity Test, 30 op
Alternative
469097S: Master's Thesis in Automotive Engineering, 30 op
469091S: Master's Thesis in Machine Design, 30 op
469092S: Master's Thesis in Materials Engineering, 30 op
469098S: Master's Thesis in Mechatronics and Machine Diagnostics, 30 op
469099S: Master's Thesis in Structural Engineering and Construction Technology, 30 op
469095S: Master's Thesis in Engineering Mechanics, 30 op
469093S: Master's Thesis in Industrial Engineering, 30 op
469094S: Master's Thesis in Production Technology, 30 op
Compulsory
469090S: The Maturity Test for MasterŽs Degree, 0 op

Tutkintorakenteisiin kuulumattomat opintokokonaisuudet ja -jaksot

902141Y: Oral Fluency, 2 op
ay724106P: Principles of Marketing (OPEN UNI), 5 op
902150Y: Professional English for Technology, 2 op
902145Y: Working Life Skills, 2 op

Opintojaksojen kuvaukset

Tutkintorakenteisiin kuuluvien opintokohteiden kuvaukset

A460120: Basic and Intermediate Studies, Mechanical Engineering, 109,5 - 120 op

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

Ei opintojaksokuvauksia.

e1

460083P: Orientation Course for New Students, 1 op

Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Reijo Saari
Opintokohteen kielet: Finnish

ECTS Credits:

1 ETCS

Timing:

Autumn semester

Learning outcomes:

At the beginning of the period, the student adopts issues related to the initiation of study, the planning of studies and the study techniques. In addition to this, the section coaches students to identify their learning skills, as well as provides group and individual guidance to progress their studies.

Contents:

Within the period, the student also becomes aware of the services offered to students by the university, the student union, student organizations and society (including guild activities, student support, physical education and medical services) and the university and faculty policies. In the initiation phase, a personal study plan (HOPS) is drawn up.
Students also receive guidance on using the services of the University Library and basic information on IT software important to study and study progress.
1. Information sessions for all students at the beginning of their studies during orientation week
2. Small group guidance; The division into small groups takes place in the orientation week. Getting to know your own small group and associated meetings organised by tutor students and tutor teachers are part of the course's performance. Accepted performance of the course also requires participation in pre-defined information sessions during the orientation week (language studies info, information from study councellor and education designer, and information sessions for new students organised by the university).
3. Drafting a personal study plan (HOPS) and presenting it with approval to a tutor teacher.

Learning activities and teaching methods:

Face-to-face teaching, e-learning

Target group:

1st year students

Person responsible:

Reijo Saari

031010P: Calculus I, 5 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Applied Mathematics and Computational Mathematics

Arvostelu: 1 - 5, pass, fail

Opettajat: Pauliina Uusitalo

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay031010P Calculus I (OPEN UNI) 5.0 op

ECTS Credits:

5 ECTS credits / 135 hours of work

Language of instruction:

Finnish. The course will be lectured also in English.

Timing:

Fall, period 1

Learning outcomes:

Upon completion of the course, the student
- knows how to solve inequalities and equations with absolute value
- identifies the concepts of vector algebra
- can use vector algebra for solving the problems of analytic geometry
- can explain basic characteristics of elementary functions
- is able to analyse the limit and the continuity of the real valued functions of one variable
- can analyse the local minima and maxima of a function
- knows how to find the derivative for a function given with parametric representation
- is able to evaluate the basic calculation of the complex numbers and can rewrite a complex number in its exponential form
- knows the connection between the integral and area
- knows integral techniques such as integration by parts, a substitution method and a partial fraction composition
- can solve problems associated with the differential and integral calculus of the real valued functions of one variable.

Contents:

- Inequalities and absolute value
- Vector algebra and analytic geometry
- Concept of the function and elementary functions
- Monotonicity of the function, the inverse function
- Limit values
- Derivative as limit value of the difference quotient. Derivatives of elementary functions
- The extreme values of a function
- Parameter presentation of the curve, polar coordinates, complex numbers
- Integral function and definite integral, applications
- Integration by parts, substitution method and integration of rational functions

Mode of delivery:

Blended learning, course material is in Moodle learning environment

Learning activities and teaching methods:

Lectures 28 h / Group work 22 h / Self-study 85 h

Target group:

1. year students of technical sciences, mathematics and physics

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

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

Assessment methods and criteria:

The course is completed with mid-term exams or a final exam. When completed with mid-term exams, exercise assignments are part of the continuous assessment. The assessment of the course is based on the learning outcomes of the course. Read more about assessment criteria at the University of Oulu webpage.

Grading:

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

Person responsible:

Pauliina Uusitalo

Working life cooperation:

The course does not contain working live cooperation.

Other information:

-

031075P: Calculus II, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Applied Mathematics and Computational Mathematics
Arvostelu: 1 - 5, pass, fail
Opettajat: Pauliina Uusitalo
Opintokohteen kielet: Finnish
Leikkaavuudet:

ay031075P	Calculus II (OPEN UNI)	5.0 op
031011P	Calculus II	6.0 op

ECTS Credits:

5 ECTS credits / 135 hours of work

Language of instruction:

Finnish. The course can be completed in English by intermediate exams or by a final exam.

Timing:

Spring semester, period 3

Learning outcomes:

Upon completion of the course, the student is able to examine the convergence of series and power series of real terms, can explain the use of power series e.g. in calculating limits, is able to solve problems related to differential and integral calculus of real and vector valued functions of several variables.

Contents:

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

Mode of delivery:

Online teaching

Learning activities and teaching methods:

Lectures 28 h / Group work 22 h / Self-study 85 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; Grossman S.I.: Multivariable Calculus, Linear Algebra, and Differential Equations; Adams, R.A.: A Complete Course Calculus.

Assessment methods and criteria:

Intermediate exams or a final exam. The exams are remote exams. It is possibility to take exams also at the university.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

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

Person responsible:

Pauliina Uusitalo

Working life cooperation:

-

Other information:

-

031076P: Differential Equations, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Applied Mathematics and Computational Mathematics
Arvostelu: 1 - 5, pass, fail
Opettajat: Ruotsalainen Keijo
Opintokohteen kielet: Finnish
Leikkaavuudet:

ay031076P	Differential Equations (OPEN UNI)	5.0 op
800320A	Differential equations	5.0 op
031017P	Differential Equations	4.0 op

ECTS Credits:

5 ECTS credits / 135 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the spring, during period 4. It is recommended to complete the course at the 1th spring semester.

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:

Online teaching, Stack/Moodle digital learning environment

Learning activities and teaching methods:

Lectures 28 h / Group work 22 h / Self-study 85 h.

Target group:

1. year students of engineering, mathematics and physics.

Prerequisites and co-requisites:

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

Recommended optional programme components:

-

Recommended or required reading:

Recommended literature: Kreyszig, E: Advanced Engineering Mathematics;

Assessment methods and criteria:

The course can be completed by intermediate exams (2 exams) or by a final exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

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

Person responsible:

Keijo Ruotsalainen

Working life cooperation:

No

461101A: Mathematical Analysis in Mechanical Engineering, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Laukkanen, Jari Jussi
Opintokohteen kielet: Finnish
Leikkaavuudet:

460084P-01	Mathematical Analysis in Mechanical Engineering, examination	0.0 op
460084P-02	Mathematical Analysis in Mechanical Engineering, exercises	0.0 op
460084P	Mathematical Analysis in Mechanical Engineering	7.0 op

ECTS Credits:

5 ects /135 hous of work

Language of instruction:

Finnish

Timing:

The lectures and weekly exercises are held during periods 1. - 2.

Learning outcomes:

Students can identify and solve various differential equations and they have knowledge on basic solvability of differential equations.

Contents:

Vectors, various differential equations, knowledge on basic solvability of differential equations.

Mode of delivery:

Face-to-face

Learning activities and teaching methods:

This course will be based on lectures 45 h and exercises 40 h and 45 h self-study during periods 1 – 2. Students are required to take a final exam or mid-term exams.

Recommended or required reading:

Grossman, S.I.: Multivariable Calculus, Linear Algebra and Differential Equations, 3rd ed., Saunders College Publishing, 1995 or 2nd ed, 1986, Glyn James, G.: Advanced Modern Engineering Mathematics, Addison-Wesley Publishing Company, 1993.

Assessment methods and criteria:

The grade of the course is based on midterm exams or a final examination. The student must pass the exercises before taking the examination.

Grading:

Numerical grading scale 1-5.

Person responsible:

University Teacher Jari laukkanen

761119P: Electromagnetism 1, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opettajat: Timo Asikainen

Opintokohteen kielet: Finnish

Leikkaavuudet:

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
761103P	Electricity and Magnetism	4.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work
- 761119P-01, Lectures and exam (4 cr)
- 761119P-02, Lab. exercises (1 cr)

Language of instruction:

Finnish

Timing:

Second fall term

Learning outcomes:

The student will be able to understand the basic concepts of electromagnetism and can apply this understanding to solve problems related to electromagnetism.

Contents:

Basic principles of electromagnetic phenomena and their physical and geometric interpretation. More detailed contents will be presented later.

Mode of delivery:

face-to-face teaching

Learning activities and teaching methods:

Lectures 32 h, 7 exercises (14 h), 2 laboratory exercises (3 hours/exercise), self-study 83 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, 13. ed., chapters 21-31. Also other editions can be used. Lecture material in finnish.

Assessment methods and criteria:

Both parts (761119P-01 and 761119P-02) will be graded separately. The final grade of the course is the weighted average of the grades of part 1 (4 cr) and part 2 (1 cr).
761119P-01: Three small midterm exams or final examination
761119P-02: Two laboratory exercises
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Numerical grading scale 0 – 5, where 0 = fail

Person responsible:

Timo Asikainen

761310A: Wave motion and optics, 5 op

Voimassaolo: 01.08.2017 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Physics

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

766349A	Wave motion and optics	7.0 op
761114P	Wave motion and optics	5.0 op
761114P-02	Wave motion and optics, lab. exercises	0.0 op
761114P-01	Wave motion and optics, lectures and exam	0.0 op
766329A	Wave motion and optics	6.0 op
761104P	Wave Motion	3.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish. The course material and exercises are available in English.

Timing:

First spring

Learning outcomes:

The student is able to treat different types of waves by methods of general theory of wave motion. The student is also able to solve problems related to basic optics and apply her/his knowledge to teaching and research in physics.

Contents:

General principles of wave motion, sound, electromagnetic waves, propagation of light, image formation in mirrors and lenses, optical instruments, interference, Fraunhofer diffraction, diffraction grating.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h, exercises 14 h, 2 laboratory exercises (3 hours/exercise), self-study 90 h

Target group:

No specific target qroup

Prerequisites and co-requisites:

Basic skills in mathematics.

Recommended optional programme components:

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

Recommended or required reading:

H. D. Young and R. A. Freedman, University Physics, Addison-Wesley, 2000 ja 2004, F. L. Pedrotti ja L. S. Pedrotti, Introduction to optics, Prentice-Hall, 2. ed., 1993 ja E. Hecht, Optics, (3rd ed.), Addison Wesley Longman, 1998.

Assessment methods and criteria:

Two written intermediate examinations or one final examination

Grading:

Numerical grading scale 0 – 5, where 0 is fail

Person responsible:

Seppo Alanko

Working life cooperation:

No work placement period

Other information:

Includes parts:
761310A-01 Wave motion and optics, lectures and exam
761310A-02 Wave motion and optics, lab. exercises

555225P: Basics of industrial engineering and management, 5 op

Voimassaolo: 01.01.2014 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Elina Jääskä

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay555225P	Basics of industrial engineering and management (OPEN UNI)	5.0 op
555221P	Introduction to Production	2.0 op
555220P	Basic Course in Industrial Engineering and Management	3.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish. English material is also used.

Timing:

Period 1.

Learning outcomes:

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

- describe what industrial engineering and management (or operations management) means
- explain the core concepts of business operations and utilise these concepts in describing and analysing operations of an organisation
- explain in general terms the factors that affect economic performance of organisations
- utilise the terminology used in industrial engineering and management (operations management), describe the financial processes of companies and based on this describe the use of cost accounting in organisational decision-making
- calculate unit costs in various simplified settings, calculate various alternatives, as well as perform planning and goal oriented calculations based on given data, and draw conclusions based on the calculation results

Contents:

Operations and productivity, operations strategy, forecasting, accounting and cost accounting, investments and financial planning, sustainability, capacity management, location decisions, layout strategies, human resources management, supply chain management, subcontracting, inventory management, production planning, MRP & ERP, production scheduling, Just-in-Time & Lean operations, maintenance.

Mode of delivery:

Web-based teaching 20 hours / practices 14 hours / Independent studying 100 hours.

Learning activities and teaching methods:

Web-based lectures 20 h / exercises 14 h / self-study 100 h.

Target group:

Industrial Engineering and Management students and other students taking Industrial Engineering and Management as minor.

Prerequisites and co-requisites:

No prerequisites exist.

Recommended optional programme components:

This course is part of the 25 ECTS module of Industrial engineering and management that also includes 555285A Project management, 555242A Product development, 555264P Managing well-being and quality of working life, and 555286A Process and quality management.

Recommended or required reading:

Lecture and exercise materials. Heizer, J. & Render, B. (2014) Operations management: sustainability and supply chain management, 11th ed. Pearson. In addition, recommended materials include Martinsuo, M. et al. (2016) Teollisuustalous kehittyvässä liiketoiminnassa chapters 7-9, 16 and 26.

Assessment methods and criteria:

This course utilises continuous assessment. During the course, there are seven mandatory weekly assignments.

Grading:

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

Person responsible:

MSc (Tech.) Elina Jääskä

Working life cooperation:

-

Other information:

Substitutes courses 555220P Basic Course in Industrial Engineering and Management 3 ECTS cr and 555221P Introduction to Production 2 ECTS cr.

030005P: Information Skills, 1 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Faculty of Technology

Arvostelu: 1 - 5, pass, fail

Opettajat: Ursula Heinikoski

Opintokohteen kielet: Finnish

Leikkaavuudet:

030004P	Introduction to Information Retrieval	0.0 op

ECTS Credits:

1 ECTS credit / 27 hours of work

Language of instruction:

Finnish

Timing:

Architecture 3. spring semester, period III;
biochemistry 3. autumn semester;
biology 3. autumn semester, period I;
chemistry 3. autumn semester, period I;
civil engineering 2. spring semester, period IV;
computer science and engineering 2. spring semester, period IV;
electronics and communications engineering 3. spring semester;
geosciences 2. spring semester, period IV;
geography 3. semester, periods I and III;
industrial engineering and management 3. year;
information processing sciences 1. or 3. year;
mathematics and physics 1. spring semester, period III;
mechanical engineering 3. year;
mining engineering and mineral processing 3. year;
process and environmental engineering 2. year, period II;
Master's degree students in industrial engineering and management 1st year.

Learning outcomes:

Upon completion of the course, the students:
- can search scientific information,
- can use the most important databases of their discipline,
- know how to evaluate search results and information sources,
- can use the reference management tool.

Contents:

Scientific information retrieval process, the most important databases and publication channels of the discipline, evaluation of the reliability of information sources and reference management tool.

Mode of delivery:

Blended teaching: classroom training, web-based learning material and exercises, a group assignment.

Learning activities and teaching methods:

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

Target group:

Compulsory for all bachelor degree students of Faculty of information technology and electrical engineering, Faculty of Technology and Faculty of science. Compulsory also for those Master’s degree students in Industrial Engineering and Management who have no earlier studies in the information skills. Optional for the students of biochemistry.

Recommended optional programme components:

In biochemistry the course is completed as a part of 740376A Bachelor’s Thesis.

Recommended or required reading:

Web learning material Tieteellisen tiedonhankinnan opas

Assessment methods and criteria:

Passing the course requires participation in the training sessions and successful completion of the course assignments.

Grading:

pass/fail

Person responsible:

Ursula Heinikoski

465101A: Introduction to materials for mechanical engineering, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Anna Kisko

Opintokohteen kielet: Finnish

Leikkaavuudet:

465061A-01	Materials Engineering I, examination	0.0 op
465061A-02	Materials Engineering I, design exercise	0.0 op
465061A-03	Materials Engineering I, laboratory exercise 1	0.0 op
465061A-04	Materials Engineering I, laboratory exercise 2	0.0 op
465061A-05	Materials engineering I, laboratory exercise 3	0.0 op
465061A	Materials Engineering I	5.0 op

ECTS Credits:

5 ects/135 hours study time

Language of instruction:

Finnish

Timing:

Lectures and laboratory works, 3 and 4 periods

Learning outcomes:

The aim of the course is to introduce the common physical (metallurgical) phenomena in metal alloys and other construction materials. He/she understands the effect of different microstructural features on the mechanical properites and the processibility of the above mentioned materials. Finally, he/she is familiar with typical non-destructive and destructive testing techniques in material science.

Contents:

Solidification and phase transformations, plastic deformation, static recovery and recrystallization, effect of microstructure on mechanical properties of metal alloys, typical corrosion mechanisms, fatigue in metal alloys, creep in metal alloys, and non-destructive and destructive material testing.

Mode of delivery:

Face-to face teaching

Learning activities and teaching methods:

32 hours lectures/ 12 hours laboratory exercises/91 hours indepedent studies. Three laboratory excersises are included in the course.

Target group:

Mandatory in the bachelor's stage for all students in the Mechanical Engineering Degree Program.

Prerequisites and co-requisites:

None

Recommended or required reading:

Lecture booklet (In Finnish). Other material will be announced at the beginning of the course.

Assessment methods and criteria:

Final exam. The final grade is based on the final exam.

Grading:

Numerical grading scale 1 - 5. Laboratory exercises will be graded as "pass"/"fail".

Person responsible:

Anna Kisko

464101A: Machine drawing and CAD, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

464051A Machine Drawing 3.5 op

464051A-01 Machine Drawing, examination 0.0 op

464051A-02 Machine Drawing, excercise 0.0 op

464052A CAD 3.5 op

ECTS Credits:

5 ects / 133 hours of studying work.

Language of instruction:

Finnish, can be completed in English as a book examination

Timing:

Lectures, Autumn periods 1.-2. Exercises, periods 1. - 2. , and practical work, period 2.

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. Students also learn how to use the computer system for modeling and drafting machine parts and assemblies.

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. Machine parts and assemply modeling and making drawings with computer aided design software.

Mode of delivery:

Face-to-face

Learning activities and teaching methods:

Lectures 30 h / exercises 30 h / computer aided design exercises 20 h / practical work 53 h. Drawing and Modeling exercises will be group exercises and practical work will be individual.

Target group:

1st year mechanical engineering students

Recommended optional programme components:

The course is an independent entity and does not require other studies to be completed at the same time.

Recommended or required reading:

Pere, A.: Koneenpiirustus1 & 2, Kirpe Oy, Espoo. Other literature will be informed on lectures.

Assessment methods and criteria:

Final exam 50%, exercises 25% and practical work 25% of the final grade.

Grading:

Numerical grading scale 1-5 / fail

Person responsible:

Jussi Salakka

461102A: Statics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Lahtinen, Hannu Tapio

Opintokohteen kielet: Finnish

Leikkaavuudet:

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

ECTS Credits:

5 ETCS / 149 hours of work

Language of instruction:

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

Timing:

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

Learning outcomes:

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

Contents:

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

Mode of delivery:

Implemented as Face-to-face -teaching.

Learning activities and teaching methods:

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

Target group:

Compulsory for candidate degree students of mechanical engineering programme.

Prerequisites and co-requisites:

Now prerequisites required.

Recommended optional programme components:

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

Recommended or required reading:

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

Assessment methods and criteria:

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

Grading:

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

Person responsible:

University teacher Hannu Lahtinen

Other information:

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

461103A: Strength of materials I, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Lahtinen, Hannu Tapio

Opintokohteen kielet: Finnish

Leikkaavuudet:

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

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

461010A Strength of Materials I 7.0 op

ECTS Credits:

5 ETCS / 149 hours of work

Language of instruction:

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

Timing:

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

Learning outcomes:

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

Contents:

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

Mode of delivery:

Implemented as Face-to-face -teaching.

Learning activities and teaching methods:

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

Target group:

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

Prerequisites and co-requisites:

The recommended preceding course is 461102A Statics.

Recommended optional programme components:

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

Recommended or required reading:

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

Assessment methods and criteria:

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

Grading:

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

Person responsible:

University teacher Hannu Lahtinen

Other information:

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

463101A: Introduction to manufacturing technology, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jouko Heikkala

Opintokohteen kielet: Finnish

Leikkaavuudet:

463052A-01	Introduction to Manufacturing Technology, examnation	0.0 op
463052A-02	Introduction to Manufacturing Technology, excercises	0.0 op
463052A	Introduction to Manufacturing Technology	5.0 op

ECTS Credits:

5 ECTS

Language of instruction:

Finnish

Timing:

Lectures and exercises periods 3. - 4.

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. Upon completion of the course, the student is able to name the key 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 common materials of cutting tools.

Contents:

Mechanical engineering materials, workshop manufacturing methods and tools, measurements, assembly, manufacturing design, numerical control.

Mode of delivery:

Face-to-face teaching, independent work.

Learning activities and teaching methods:

The course includes 20 hours of lectures, lecture assignments, lesson assignments, practical work / seminar, laboratory work and exam.

Recommended or required reading:

Ihalainen, E., Aaltonen, K., Aromäki, M., Sihvonen, P.: Valmistustekniikka, Otatieto Oy, Helsinki 2007, 490 s. Supplementary material will be given during the lectures.

Assessment methods and criteria:

Exam and examinations are graded. The overall grade is determined as follows:

- Required exam grade 30 %
- Compulsory Assignment 25 %
- Lecture Assignment 15 %
- Volunteer Demo in the Machine Workshop 10 %
- Part performances of the course will expire during the Academic year

Grading:

Numerical grading scale 1-5.

Person responsible:

Jouko Heikkala

461104A: Strength of materials II, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Laukkanen, Jari Jussi

Opintokohteen kielet: Finnish

Leikkaavuudet:

461011A-01	Strength of Materials II, examination	0.0 op
461011A-02	Strength of Materials II, exercises	0.0 op
461011A	Strength of Materials II	7.0 op

ECTS Credits:

5 ECTS

Language of instruction:

Finnish

Timing:

Periods 1-2.

Learning outcomes:

The student can apply fatigue design principles in structural analysis and use fracture mechanics to evaluate the life of simple structures. He / she is also able to solve stability, buckling and buckling bending of rod and beam structures. The student is able to solve curve beam bending state and free and prevented torque situations.
After completing the course, the student will have a general understanding of the different areas of strength and will be able to discuss the potential of strength design with experts in the field.

Contents:

Dimensioning of structures for fatigue. Elements of fracture mechanics. Stability, buckling and buckling of rod and beam structures. Curve bar bending. Free and prevented torsion.

Mode of delivery:

Contact teaching

Learning activities and teaching methods:

Lectures 45 h, exercises 45 h and independent learning 45 h. Homework.

Target group:

Compulsory for Mechanical Engineering Degree students.

Prerequisites and co-requisites:

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 mekaniikka, 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:

The course can be completed with an intermediate exam or a final exam. You can take the exam only after you have successfully completed your homework.

Grading:

The course uses 1-5 numerical grading scale. On a numerical scale, zero indicates a failed performance.

Person responsible:

University Teacher Jari Laukkanen.

461106A: Dynamics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Koivurova Hannu

Opintokohteen kielet: Finnish

Leikkaavuudet:

461018A-01	Dynamics, examination	0.0 op
461018A-02	Dynamics, exercises	0.0 op
461018A	Dynamics	4.0 op

ECTS Credits:

5 ECTS credits / 120 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the spring semester, during periods 3 and 4. It is recommended to complete the course at the 2st spring semester.

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 teaching

Learning activities and teaching methods:

Lectures 45 h / Exercise 30 h / Self-study 45 h.

Recommended optional programme components:

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

Recommended or required reading:

Salmi T., Virtanen S. (2006) Dynamiikka, Pressus;Salmi, T. (2003) Dynamiikka 1, kinematiikka, Pressus; Salmi, T. (2002) Dynamiikka 2, kinetiikka, 2. p., Pressus. Oheiskirjallisuus: Salonen, E.M. (2000) Dynamiikka I, 8. korj. p., Otatieto; Salonen, E.M. (1999) Dynamiikka II, 8. korj. p., Otatieto; Beer, F., Johnston, E.(2007) Vector Mechanics for Dynamics, 9.ed., McGraw-Hill

Assessment methods and criteria:

This course utilizes continuous assessment. During the course, there are three intermediate exams. In addition to this, the students will be asked to calculate homeworks, and theses homeworks will be

assessed. The assessment of the course is based on the learning outcomes of the course. The more detailed assessment criteria are available on the Moodle Study Portal.

Grading:

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

Person responsible:

University Lecturer Hannu Koivurova

464102A: Design of machine elements, 10 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Eino Antikainen

Opintokohteen kielet: Finnish

Leikkaavuudet:

464055A	Machine Design I	8.0 op
464055A-01	Machine Design I, examination	0.0 op
464055A-02	Design exercise	0.0 op
464055A-03	Design exercise I, home exercises	0.0 op
462033A	Machine Design	7.0 op

ECTS Credits:

10 ects / 267 hours of studying work.

Language of instruction:

Finnish, can be completed in English as a book examination

Timing:

Lectures and exercises arranged at autumn periods 1 -2., practical work end of 2 period.

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:

Lectures 60 h / exercises 14 h /practical work 120 h / individual studies 73 h.

Target group:

2nd year mechanical engineering student

Prerequisites and co-requisites:

Machine Drawing and CAD

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:

Final Exam, homeworks and practical work. Final exam is 50% and practical work 50% of final grade. Homeworks will be graded pass/fail.

Grading:

Numerical grading scale 1-5 / fail

Person responsible:

Eino Antikainen

461105A: Technical thermodynamics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Lahtinen, Hannu Tapio

Opintokohteen kielet: Finnish

Leikkaavuudet:

461035A Heat and Mass Transfer I 3.5 op

ECTS Credits:

5 ETCS / 120 hours of work

Language of instruction:

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

Timing:

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

Learning outcomes:

After the course, the student can explain the principal laws of thermodynamics and their impact on energy conversions. Student can apply the energy balance equations for closed and open systems in the calculation of properties and path functions of different processes. The student can explain the theoretical foundations of combustion engines, gas and vapor power plants, and refrigerators and heat pumps. In addition, student can solve problems regarding fluid flow in pipes and heat and moisture transfer.
The course gives fundamental information of thermodynamics and its applications.

Contents:

Heat and moisture transfer and fluid flow in pipes; Principal laws in thermodynamics and basic concepts involved; Applications in production, transformation, transfer and use of energy.

Mode of delivery:

Implemented as Face-to-face -teaching.

Learning activities and teaching methods:

Lectures 30 h / exercises 30 h / independent work of solving homework problems 60 h.

Target group:

Compulsory for candidate degree students of mechanical engineering programme.

Prerequisites and co-requisites:

Now prerequisites required.

Recommended optional programme components:

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

Recommended or required reading:

Cengel, Y.A. & Boles, M.A., Thermodynamics; An Engineering Approach, Fifth edition in SI-units, 2006; Cengel, Y.A., Heat Transfer; A Practical Approach, Second edition, 2003.

Assessment methods and criteria:

The course is passed by midterm exams or by a final exam. During the course two midterm exams are arranged. Every week exercises are organized, and part of the exercise problems are left for independent work.

Grading:

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

Person responsible:

University teacher Hannu Lahtinen

463102A: Manufacturing technology I, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Pirkola, Heikki Juhani
Opintokohteen kielet: Finnish
Leikkaavuudet:

463053A-01	Manufacturing Technology I, examination	0.0 op
463053A-02	Manufacturing Technology I, exe	0.0 op
463053A	Manufacturing Technology I	3.5 op
463053A2	Manufacturing Technology I	5.0 op

ECTS Credits:

5 ects/135 hours of work

Language of instruction:

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

Timing:

Lectures and exercises take place during the spring periods III - IV.

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. 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 40 h and exercises 55 h (10 h of guided teaching). 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.

Prerequisites and co-requisites:

463101A Introduction to Manufacturing Technology

Recommended or required reading:

Manufacturing, Engineering & Technology, Fifth Edition, by Serope Kalpakjian and Steven R. Schmid. ISBN 0-13-148965-8. © 2006 Pearson Education, Inc., Upper Saddle River, NJ. The additional material that is in English will be given distributed at the lectures.

Assessment methods and criteria:

Teacher gives instructions at the beginning of the course.

Grading:

Numerical grading scale 1-5.

Person responsible:

Heikki Pirkola

465102A: Materials for mechanical engineering, 5 op

Voimassaolo: 01.08.2016 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Anna Kisko
Opintokohteen kielet: Finnish

ECTS Credits:

5 ETCS

Language of instruction:

Finnish

Timing:

Lectures and materials selection exercise take place during the periods 1 and 2, autumn term.

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. After the course, the student is able to classify different structural materials such as steels, cast irons, non-ferrous metals, polymer based materials and structural ceramics. 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, including steels (structural, QT, tool, stainless), cast irons, non-ferrous metal alloys (aluminium, titanium, magnesium, copper, nickel) and polymer based materials (structural plastics, plastics composite, elastomers, rubbers). Materials selection taking into account different demands. Ashby diagrams.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

The course is made up of lectures (32 h) and a materials selection exercise in small group during the periods 1 and 2.

Target group:

Mandatory in the bachelor's stage for all students in the Mechanical Engineering Degree Programme.

Prerequisites and co-requisites:

Reommended: 465101A Introduction to Materials for Mechanical Engineering.

Recommended or required reading:

Lecture booklet (in Finnish); Exercise materials

Assessment methods and criteria:

The final grade is based on the combined points from exam and assignment/practical work or on the basis of the alternative assessment practices described at the beginning of the course.

Grading:

Numerical grading scale 1-5 / fail.

Person responsible:

Anna Kisko

460020A: Basics of computing and programming in mechanical engineering, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Lumijärvi, Jouko Veikko Juhani, Louhisalmi, Yrjö Aulis
Opintokohteen kielet: Finnish
Leikkaavuudet:

460085A Engineering Software Tools 3.0 op

ECTS Credits:
5 ECTS
Language of instruction:
Finnish
Timing:
3. and 4. periods.
Contents:
Matchcad, Matlab and Python
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures and exercises
Target group:
Students of the bachelor's stage of the Mechanical Engineering Degree Programme.
Prerequisites and co-requisites:
Recommended pre-information: Strength of Materials I and II.
Person responsible:
Yrjö Louhisalmi
Jari Niskanen
Jouko Lumijärvi

462101A: Information technology and machines, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Liedes, Toni Mikael
Opintokohteen kielet: Finnish

ECTS Credits:
5 cr / 133 hours of work
Language of instruction:
Finnish
Timing:

The course is held in the spring semester, during periods 3 and 4. It is recommended to complete the course at the 2nd spring semester.

Learning outcomes:

Upon completion of the course, the student will be able to explain how the information technology is utilized in modern machines. The student is able to describe how the modern machines are developed from purely mechanical systems to multi-disciplinary systems. The student is able to sort out the electrical, information technological and mechanical features of modern machines. He/she is also able to describe the interaction and interfaces of the aforementioned features. In addition to this, the student is able to separate the digital and analog domains. The student is able to create a simple computer program for machine control. He/she is able to name the sensors and actuators being used in automated machines. Furthermore, the student is able to list examples of machines taking advantage of modern information technology.

Contents:

History of mechanical engineering and information technology; Information technology as an enabler of the development of machines; Requirements and boundary conditions for automatisation of machines; Concepts of information technology and electronics; Basics of programming and logical reasoning; Examples of machine applications taking advantage of modern information technology.

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

Lectures 20 h / Group work 12 h / Self-study 101 h

Target group:

Bachelor's degree students of mechanical 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. Other material is in the beginning of the course.

Assessment methods and criteria:

This course utilizes continuous assessment. During the course there are exercises and intermediate exams. The exercises and the exams will be assessed. The assessment of the course is based on the learning outcomes of the course.

Grading:

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

Person responsible:

Lecturer Toni Liedes

462103A: Introduction to Maintenance, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jouni Laurila

Opintokohteen kielet: Finnish

Leikkaavuudet:

464087A-01	Maintenancy Technology, examination	0.0 op
464087A-02	Maintenancy Technology, exercise work	0.0 op
464087A	Maintenancy Technology	5.0 op

ECTS Credits:

5 ECTS credits / 135 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the autumn semester, during periods 1 and 2. It is recommended to complete the course at the 3rd autumn semester.

Learning outcomes:

After completing the course, students will be able to explain key concepts related to the maintenance industry, define what maintenance is, and describe its most important impacts on productivity, safety and the environment. The student will be able to name the levels of maintenance activities and describe what aspects are involved in choosing a maintenance strategy. After the course the student is able to calculate the most important reliability indicators and evaluate the overall efficiency of production equipment and the factors affecting it. and classify maintenance activities as corrective and preventive. The student is able to explain what issues and practices are essential for keeping the production assets in good condition. The student can also take into account maintenance related issues in different planning tasks.

Contents:

Basic Concepts, Objectives and Effects of Maintenance, Types of Maintenance and Major Maintenance Strategies, Failure and Affected Factors, Reliability and Modeling, Reliability and Measurement, Life Cycle Cost and Returns, Importance of Lubrication and Cleanup in Maintenance, Maintenance.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

More detailed performance methods are given at the start of the course.

Target group:

Bachelor's degree students in the mechanical engineering

Recommended optional programme components:

The course is an independent entity.

Recommended or required reading:

Lecture handout and the other material delivered during the course. Supplementary readings: Järviö, J., Kunnossapito. Helsinki, KP-Media Oy / 2012.

Assessment methods and criteria:

Final examination and the other graded assignments

Grading:

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

Person responsible:

Jouni Laurila.

555265P: Occupational Safety and Health Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Henri Jounila

Opintokohteen kielet: Finnish

Leikkaavuudet:

555263A	Technology, Society and Work	2.0 op
555260P	Basic Course in Occupational Safety and Wellbeing at Work	3.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish. English material is also used.

Timing:

Periods 3-4.

Learning outcomes:

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

- explain the basic terms of occupational safety and health
- assess the importance of occupational safety, health and well-being at work
- assess the significance of occupational safety in the improving of productivity and quality
- apply different safety analysis
- explain core issues of occupational safety and health management

Contents:

Occupational safety and health, safety management, safety culture, laws and standards, hazards and risks, occupational diseases and work accidents, safety analysis, occupational safety at shared industrial work sites, occupational safety card, HSEQ-assessment procedure, other current issues.

Mode of delivery:

The tuition will be implemented as face-to-face teaching.

Learning activities and teaching methods:

Lectures and assignments 26 h / group work 40 h / tasks and self-study 68 h.

Target group:

Industrial Engineering and Management, Mechanical Engineering, Process Engineering and Environmental Engineering students.

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Mertanen V. 2015. Työturvallisuuden perusteet. Helsinki: Työterveyslaitos. Lecture materials. Other materials will be defined during the course.

Assessment methods and criteria:

Group work 0-5, the assessment of the tasks will be informed at the beginning of the course.

Grading:

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

Person responsible:

MSc Henri Jounila

Working life cooperation:

-

Other information:

Substitutes courses 555260P Basic Course in Occupational Safety and Wellbeing at Work + 555263A Technology, Society and Work.

555285A: Project management, 5 op

Voimassaolo: 01.01.2014 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

555288A Project Management 5.0 op

ay555285A Project management (OPEN UNI) 5.0 op

555282A Project Management 4.0 op

555280P Basic Course of Project Management 2.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish. Check the course in English 555288A Project Management.

Timing:

Period 2.

Learning outcomes:

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

- describe explain the essential concepts and methods related to project management
- apply project management methods to create a schedule for a project and calculate critical path
- understand essential concepts related to project cost management and able to apply earned value method and three point estimate to manage project costs
- recognises the essential tasks of project risk management

Contents:

Defining project management, project goals and objectives, project phases and project life-cycle management, project planning, organising and scope management, schedule management, cost management, earned value calculation and project risk management, project stakeholder management, project communications management, the role of project manager, new modes of project delivery

Mode of delivery:

The tuition will be implemented as web-based teaching.

Learning activities and teaching methods:

Web-based lectures 16h, self-study 118h

Target group:

Industrial Engineering and Management students and other students taking Industrial Engineering and Management as minor.

Prerequisites and co-requisites:

No prerequisites exist.

Recommended optional programme components:

This course is part of the 25 ECTS module of Industrial engineering and management that also includes555225P Basics of industrial engineering and management, 555242A Product development, 555264P Managing well-being and quality of working life, and 555286A Process and quality management.

Recommended or required reading:

Lecture material, exercise book, Artto, Martinsuo & Kujala 2006. Projektiliiketoiminta. WSOY

Assessment methods and criteria:

Weekly assignments and final online exam

Grading:

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

Person responsible:

Assistant professor Kirsi Aaltonen

Working life cooperation:

Videos from the industry’s projects

Other information:

Substitutes courses 555280P Basic Course of Project Management + 555282A Project Management.

460003A: Practical training I, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Practical training
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Reijo Saari
Opintokohteen kielet: Finnish
Leikkaavuudet:

460001A Practical Training 3.0 op

Target group:

Students of the Bachelor's Degree in Mechanical Engineering.

Recommended or required reading:

More information from Reijo Saari, the person responsible for the training.

Person responsible:

Reijo Saari

901045Y: Second Official Language (Swedish), Oral Skills, 1 op

Voimassaolo: 01.08.2014 -
Opiskelumuoto: Language and Communication Studies
Laji: Course
Vastuuyksikkö: Languages and Communication
Opintokohteen kielet: Swedish
Leikkaavuudet:

901061Y Second Official Language (Swedish), Oral Skills 1.0 op

901044Y: Second Official Language (Swedish), Written Skills, 1 op

Voimassaolo: 01.08.2014 -
Opiskelumuoto: Language and Communication Studies
Laji: Course
Vastuuyksikkö: Languages and Communication
Opintokohteen kielet: Swedish
Leikkaavuudet:

901060Y Second Official Language (Swedish), Written Skills 1.0 op

Proficiency level:

This course is only for Finnish speaking students with CEFR-level A2 in Swedish language. University of Oulu, Languages and Communication unit don’t offer Beginners courses in Swedish.

Recommended optional programme components:

-

e2

902147Y: Academic Vocabulary for Science and Technology, 2 op

Opiskelumuoto: Language and Communication Studies

Laji: Course

Vastuuyksikkö: Languages and Communication

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Proficiency level:

CEFR Level: B2-C1 (All levels)

Status:

This course can be chosen in partial completion of the English language requirement for students in the engineering programmes in the Faculty of Technology (TTK) and Faculty of Information Technology and Electrical Engineering (TST).

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:

2 ECTS credits. The workload is 53 hours.

Language of instruction:

English

Timing:

The course takes place in both autumn (periods 1 and 2) and spring (periods 3 and 4) semesters. Check the study guide for availability in your department.

Learning outcomes:

By the end of the course, you are expected to
1) explain and apply general academic / scientific vocabulary from Coxhead's Academic Word List (AWL)
2) differentiate between informal (non-academic) and formal / academic language,
3) demonstrate use of academic vocabulary in a variety of writing and communication contexts.

Contents:

The general aim of this course is to activate and broaden your basic scientific vocabulary, i.e. the core vocabulary of scientific texts, which is principally the same regardless of the field (AWL). During this process, you will become aware of the strategies which best promote your skills to learn and memorise vocabulary. The ultimate aim is to help you gain the skills to read and write academic / scientific text and to discuss related topics. To help you achieve the learning outcomes, you will work on various written and oral activities which focus primarily on practicing vocabulary learning strategies, word formation, and the use of the most frequent academic vocabulary (AWL sublists).

Mode of delivery:

Contact teaching and independent study

Learning activities and teaching methods:

Lessons 26 hours / independent work 27 hours. The independent work includes a written academic essay or report; vocabulary tests; presentations, which will be given in class to small groups of students; and other homework assignments. Active participation is essential.

Target group:

Students in the engineering programmes (TTK and TST)

Prerequisites and co-requisites:

-

Recommended optional programme components:

This is an elective course which can be taken after 902150Y PET by students in the engineering programmes (TTK and TST).

Recommended or required reading:

Course materials will be provided by the teacher in electronic form.

Assessment methods and criteria:

Regular and active participation in the weekly sessions will be observed in continuous assessment that is based on the learning outcomes of the course. Satisfactory completion of the in-class/ homework assignments and the vocabulary tests is required.
See more about assessment criteria, https://www.oulu.fi/forstudents/assesment-criteria.

Grading:

Pass/Fail

Person responsible:

Susan McAnsh. See contact teachers, https://www.oulu.fi/kielikoulutus/node/56574.

Working life cooperation:

-

Other information:

-

902142Y: Business Correspondence, 2 op

Voimassaolo: 01.08.2014 -

Opiskelumuoto: Language and Communication Studies

Laji: Course

Vastuuyksikkö: Languages and Communication

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: English

Proficiency level:

CEFR B2 - C1 (All Levels)

Status:

This course can be chosen in partial completion of the English language requirement for students in the engineering programmes in the Faculty of Technology (TTK) and Faculty of Information Technology and Electrical Engineering (TST).

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:

2 credits. The workload is 53 hours

Language of instruction:

English

Timing:

The course takes place in both autumn (periods 1 and 2) and spring (periods 3 and 4) semesters. Check the study guide for availability in your department.

Learning outcomes:

By the end of the course, you are expected to have demonstrated:

- the ability to write clear and effective business letters conveying information and details accurately,
- the ability to use an appropriate level of formality and style for business communications,
- mastery of the conventional formats and layouts of different types of business letters.

Contents:

The aim of this course is to introduce different types of business correspondence and the format used when communicating in writing. Types of correspondence include communication in business-to-business scenarios and between a business and the public.

Mode of delivery:

Self-access: the course operates within an online workspace, with online support from the teacher.

Learning activities and teaching methods:

Introductory session 2 hours / independent learning 51 hrs / optional text clinics. Assignments, instructions and course resources are available in the online course workspace. Completed assignments are submitted electronically to the teacher. The teacher provides feedback and any problems are discussed either by written electronic communication or at one of the optional text clinics.

Target group:

Students in the engineering programmes (TTK and TST)

Prerequisites and co-requisites:

-

Recommended optional programme components:

This is an elective course which can be taken after 902150Y PET by students in the engineering programmes (TTK and TST).

Recommended or required reading:

Course materials are provided in an electronic form that can be downloaded.

Assessment methods and criteria:

All assignments must be completed to a standard of effective business correspondence based on the learning outcomes of the course. In addition, there is a test at the end of the course.
Lue lisää opintosuoritusten arvostelusta yliopiston verkkosivulta.

Grading:

Pass/Fail

Person responsible:

Susan McAnsh

Working life cooperation:

-

Other information:

-

902149Y: Mechanics of Writing, 2 op

Opiskelumuoto: Language and Communication Studies
Laji: Course
Vastuuyksikkö: Languages and Communication
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: English

Proficiency level:

CEFR B2-C1 (Average - Advanced)

Status:

This course can be chosen in partial completion of the English language requirement for students in the engineering programmes in the Faculty of Technology (TTK) and Faculty of Information Technology and Electrical Engineering (TST).

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:

2 credits. The workload is 53 hours.

Language of instruction:

English

Timing:

The course takes place in both autumn (periods 1 and 2) and spring (periods 3 and 4) semesters.

Learning outcomes:

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

1. you can organise the structure of sentences and paragraphs for clarity and impact,
2. you can use punctuation appropriately,
3. you can make appropriate stylistic choices in academic writing.

Contents:

The purpose of this course is to help you develop essential writing skills for the production of academic and professional texts in technology.
The module covers three main topics: ordering information in sentences, punctuation and sentence style. During the module, you work independently, studying online handouts and consolidating your learning by working through online exercises.

Mode of delivery:

Web-supported independent study

Learning activities and teaching methods:

This module is completed through independent study of online resources (online handouts and exercises). An online tutor is available to answer questions and give guidance whenever necessary.

Target group:

Students in the engineering programmes (TTK and TST). Especially recommended for students with M or higher for English in matriculation exam.

Prerequisites and co-requisites:

-

Recommended optional programme components:

This is an elective course which can be taken after 902150Y PET by students in the engineering programmes (TTK and TST).

Recommended or required reading:

Course materials are available online.

Assessment methods and criteria:

The module is assessed by a final test, which can be taken on any of three test dates (approximately a month apart) each term in a classroom on the Linnanmaa campus.
Lue lisää opintosuoritusten arvostelusta yliopiston verkkosivulta.

Grading:

Pass/Fail

Person responsible:

Susan McAnsh - See contact teachers

Working life cooperation:

-

Other information:

The course will be organized by online tutoring.
You can enroll for the exam only if you have been accepted for the MoW course during this semester (so enroll first) or in the last two years (do not re-enroll).
You cannot take the exam without registering.
Acceptance information for the course will be sent to your university email address, so make sure your university email address is up to date in WebOodi.
Please, contact the teacher directly if you have any questions about the exam or any other subject related to the course.
Note! Registration for each test separately -> Exams begin on the hour and last 120 minutes.

903009P: Technical German, Elementary Course, 6 op

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

ECTS Credits:

6 ECTS

Learning activities and teaching methods:

Students started their studies before autumn 2021:
Choose: Elementary Course in German I (3 cr) and 03064Y Elementary Course in German II (3 cr).

Person responsible:

Kaisu Jarde and Marja Pohjola-Effe

903010P: Technical German 1, 6 op

Voimassaolo: 01.08.1995 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Languages and Communication
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: German

903012P: Technical German 3, 6 op

Voimassaolo: 01.08.1995 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Languages and Communication
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: German

Learning activities and teaching methods:

Choose a course combination that matches your skill level, total 6 cr:

903030Y Intermediate German Course II (3 cr) **and** 903042Y Intermediate German Course III (3 cr)
OR
903042Y Intermediate German Course III (3 cr) **and** 903048Y Intermediate German Course IV (3 cr)
OR
903042Y Intermediate German Course III (3 cr) and one of these courses:
903000Y Reading Comprehension in German, 2 - 3 cr (proficiency level B1/B2),
903041Y Interkulturelle Kommunikation/Tandem, 2 - 4 cr (B1),
903052Y German Writing Course, 2-3 cr (B1/B2)
903054Y German Business Talk and Correspondence , 3 - 4 cr (B1).
OR
903048Y Intermediate German Course IV (3 cr) + one of these courses:
903000Y Reading Comprehension in German, 2 - 3 cr (proficiency level B1/B2),
903041Y Interkulturelle Kommunikation/Tandem, 2 - 4 cr (B1),
903052Y German Writing Course, 2-3 cr (B1/B2)
903054Y German Business Talk and Correspondence , 3 - 4 cr (B1).

Person responsible:

Oliver Jarde

904054P: Technical Russian 1, 7,5 op

Voimassaolo: 01.08.1995 -
Opiskelumuoto: Basic Studies
Laji: Course
Vastuuyksikkö: Languages and Communication
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Russian

Proficiency level:

A2/B1 on the CEFR scale.

Status:

See the study guide of your degree programme.

Required proficiency level:

A2

ECTS Credits:

6 ECTS credits

Language of instruction:

Russian and Finnish

Timing:

Students who wish to participate in this course are asked to contact the course's teacher at the beginning of September.

Learning outcomes:

The course aims to give the student the means to manage in common communication situations and understand spoken and written Russian in professional contexts and discuss questions related to his/her special field.

Contents:

Various modes of studying: handouts, discussion exercises and language lab sessions.

Mode of delivery:

Group- and independent work.

Learning activities and teaching methods:

Self-study and group work.

Target group:

Students of the Faculty of Technology.

Prerequisites and co-requisites:

Elementary and intermediate courses in Russian or equivalnt knowledge.

Recommended optional programme components:

-

Recommended or required reading:

Material provided by the teacher.

Assessment methods and criteria:

Regular and active participation. Completion of the given assignments.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Pass / fail

Person responsible:

Ari Hepo-aho

Working life cooperation:

-

Other information:

-

A460121: Module Preparing for the Option, Automotive Engineering, 40 op

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

Ei opintojaksokuvauksia.

e3

461107A: Finite Element Methods I, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Lumijärvi, Jouko Veikko Juhani
Opintokohteen kielet: Finnish
Leikkaavuudet:

461033A	Finite Element Methods I	3.5 op
461033A-01	Finite Element Methods I, examination	0.0 op
461033A-02	Finite Element Methods I, exercises	0.0 op

ECTS Credits:

5 ECTS credits / 132 hours of work

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. After this course, the student can explain the basic idea of the FEM. He/she can analyze simple truss-, frame- and plane structures and explain the theoretical background of the calculations.

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.-2.

Target group:

Students of the bachelor's stage of the Mechanical Engineering Degree Programme.

Prerequisites and co-requisites:

Strength of Materials I and II and Fundamentals of mechanical computing and programming

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:

The grade of the course is based on a final exam. The student must pass the exercises before taking the examination.

Grading:

Numerical grading scale 1-5.

Person responsible:

Jouko Lumijärvi

462102A: Machine automation actuators, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Louhisalmi, Yrjö Aulis

Opintokohteen kielet: Finnish

Leikkaavuudet:

462021A-01	Machine Automation I, examination	0.0 op
462021A-02	Machine Automation I, exercise work	0.0 op
462021A	Machine Automation I	5.0 op
464064A	Actuators	5.0 op

ECTS Credits:

5 cr / 133 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the autumn semester, during periods 3 and 4. It is recommended to complete the course at the 2nd spring semester.

Learning outcomes:

After completing the course the student can explain the role of actuators in machine automation systems. The student recognizes different types of actuators and can categorize them eg. based on performance and usage limitations. The student is able to design a simple actuator operation and is able to select suitable actuators for a typical automation application. In addition, the student is able to evaluate the sensing needs and operating conditions of actuators as part of the automation system.

Contents:

Basics actuators; Basics of hydraulics, Pneumatics and electrical drives; Performance and efficiency of actuators; Hydraulic actuators; Pneumatic actuators; Electrical actuators.

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

Lectures 32 h / Group work 16 h / Self-study 85 h

Target group:

Bachelor's degree students of mechanical 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 materials. Other material is in the beginning of the course.

Assessment methods and criteria:

This course utilizes continuous assessment. The assessment can be based on learning diary, homework, exercises, seminars and exam.

Grading:

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

Person responsible:

University teacher Yrjö Louhisalmi

462104A: Machine automation, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Louhisalmi, Yrjö Aulis

Opintokohteen kielet: Finnish

Leikkaavuudet:

462022S-01	Machine Automation II, examination	0.0 op
462022S-02	Machine Automation II, exercise work	0.0 op
462022S	Machine Automation II	5.0 op

ECTS Credits:

5 cr / 133 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the autumn semester, during periods 1 and 2. It is recommended to complete the course at the 3rd autumn semester.

Learning outcomes:

Upon completion of the course, the student will be able to explain the basic principles and structures of a typical machine automation system. The student is able to divide an automation system into basic elements and explain their role and significance in the system. The student can apply the basic digital technology and logic methods in designing a typical machine automation system. In addition to this, the student knows the operating principles of programmable logic controllers (PLCs) and is able to implement a logic control for a typical application. Furthermore, the student is able to explain the basic principles of fieldbuses. The students also knows the basics of machine automation safety design.

Contents:

Basics of automation; Basics of digital technology and logic; Description of operation sequences; Architecture of programmable logic controllers and their programming; Distributed systems and fieldbuses.

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

Lectures 32 h / Group work 16 h / Self-study 85 h

Target group:

Bachelor's degree students of mechanical engineering

Prerequisites and co-requisites:

The recommended prerequisite is the completion of the following courses prior to enrolling for the course: Actuators in Machine Automation, Elementary Programming

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time. However, it is recommended to complete the course Machine Sensor Technology simultaneously.

Recommended or required reading:

Lecture material. Other material is in the beginning of the course.

Assessment methods and criteria:

This course utilizes continuous assessment. The assessment can be based on learning diary, homework, exercises, seminars and exam.

Grading:

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

Person responsible:

University teacher Yrjö Louhisalmi

462107A: Maintenance of machines, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jouni Laurila

Opintokohteen kielet: Finnish

Leikkaavuudet:

464087A-01	Maintenancy Technology, examination	0.0 op
464087A-02	Maintenancy Technology, exercise work	0.0 op
464087A	Maintenancy Technology	5.0 op

ECTS Credits:

5 ECTS credits / 135 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the spring semester, during period 4. It is recommended to complete the course at the 3rd spring semester.

Learning outcomes:

After completing the course, the student will be familiar with the principles and most common methods of implementing fitness based maintenance. They are able to explain the importance of running in production and apply the most important standards in the field of maintenance. different types of maintenance and can tell you what aspects of choosing a maintenance strategy. The student knows how to name the most common machine failure methods and the consequences of failure and can tell how to prevent failure in typical situations. The student recognizes the effects of wear and lubrication on the condition of machines

and is able to explain the basic concepts related to lubricant analysis. The student knows how to use the most common methods used in machine condition monitoring and how to use them. He / she can explain the basics of vibration measurements and can choose appropriate measurement and analysis methods to identify the most common machine failures. The student knows the importance of running in production and is able to apply the most important standards in the field of maintenance.

Contents:

Condition based maintenance, failure, wear and lubrication, common condition monitoring methods, basics of performing vibration measurements, analyzing and signal processing, common rotating machine failure detection, vibration intensity estimation, rotor dynamic balancing, machine design and condition, machine design and condition management. failure, wear and lubrication, machine condition monitoring basics and common methods.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 24 h / group work 50 h / self-study 61 h

Target group:

Bachelor's degree students in the mechanical engineering

Prerequisites and co-requisites:

The recommended prequisite is the completion of the following course: 462103A Introduction to Maintenance

Recommended optional programme components:

The course is an independent entity

Recommended or required reading:

Luentomoniste ja muu kurssin aikana jaettava materiaali. Oheiskirjallisuus: Järviö, J. & Lehtiö. T., Kunnossapito: tuotanto-omaisuuden hoitaminen. Helsinki, KP-Media Oy 2012. Antila, K., et al., Teollisuusvoitelu, KP-Media Oy, 2003. Mikkonen, H. (toim.), Kuntoon perustuva kunnossapito, KP-Media Oy, 2009.

Assessment methods and criteria:

Final examination and the other graded assignments

Grading:

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

Person responsible:

Jouni Laurila

464103A: Machine design, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Niskanen, Juhani

Opintokohteen kielet: Finnish

Leikkaavuudet:

464056A	Machine Design II	6.0 op
464056A-01	Machine Design II, examination	0.0 op
464056A-02	Design II, exercise	0.0 op
464062S	Engineering Design	20.0 op

ECTS Credits:

5 ects / 133 hours of studying work.

Language of instruction:

Finnish, can be completed in English as a book examination

Timing:

Lectures spring period 3 and 4.

Learning outcomes:

Upon completion of this course, the student is able, asa 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. Student is also able to design new product or essentially improve old product. Student knows what is required when working as a part of a product development project.

Contents:

Advanced machine design, design of assemplies and design methods. Utilization of Automation and new materials. Meaning of a machine directive.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 40 h / practical work 93 h.

Target group:

3rd year mechanical engineering students

Prerequisites and co-requisites:

Design of machine elements, Engineering drawing and CAD.

Recommended optional programme components:

The course of study is an independent entity and does not require other studies to be completed simultaneously.

Recommended or required reading:

Björk, T.& al. Koneenosien suunnittelu. WSOY, Porvoo, 2014; Shigley, J. E. ja Mischke, C. R. Mechanical Engineering Design. New York, McGraw-Hill,1983. Tuomaala, J. Koneensuunnitteluoppi, first part. Oulu, 1995. Tuomaala, J. : Koneensuunnitteluoppi, later part, Oulu, 1995. Dieter, G.E. : Engineering Design, McGraw-Hill: New York, 2000.

Assessment methods and criteria:

Final Exam and practical work. Final exam is 50% and practical work 50% of final grade

Grading:

Numerical grading scale 1-5 / fail

Person responsible:

Professor Juhani Niskanen

464104A: Product innovations, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Niskanen, Juhani

Opintokohteen kielet: Finnish

Leikkaavuudet:

464085A-01	Patenting, examination	0.0 op
464085A-02	Patenting, exercise	0.0 op
464061A-01	Techniques of Creative Working, examination	0.0 op
464061A-02	Techniques of Creative Work, design exercise	0.0 op
464085A	Patenting	3.5 op
464061A	Techniques of Creative Working	3.0 op

ECTS Credits:

5 ects / 133 hours of studying work.

Language of instruction:

Finnish, can be completed in English as a book examination

Timing:

Lectures arranged autumn during period 1, Practical work during course.

Learning outcomes:

The objective of the course for the student is to learn to find problems in familiar environment, analyze them and implement mechanical engineering to solve the problems. 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. Student can develop solution as far as it is protectable with patenting. The main emphasis is on patenting; how to protect valuable product design from imitation; and how to avoid infringement of competitors' industrial property rights. Upon completion of the course, the student can explain conditions for a patentable design and compare patenting to other ways of protecting industrial rights and is able to make an application for patent. The student also knows employer's and employee's rights in case of making an invention as an employee.

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. Product protection models and their use in competition; Comprehension and legitimacy of the protection by patent; Applying for patent and making an application for a patent; Applying for a patent in a foreign country;
Situations involving a conflict; Patent legislation.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 30 h / practical work 60 h.

Target group:

Bachelor degree students of mechanical engineering

Recommended or required reading:

Copies of lecture material.

Assessment methods and criteria:

Final exam and practical work. Both are 50% of final grade.

Grading:

Numerical grading scale 1-5 / fail

Person responsible:

Professor Juhani Niskanen

465104A: Heat treatment and welding of metals, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Timo Kauppi

Opintokohteen kielet: Finnish

Leikkaavuudet:

465077A-01	Welding Technology, examination	0.0 op
465077A-02	Welding Technology, exercises	0.0 op
465077A	Welding Technology	3.5 op

ECTS Credits:

5 cr; study time 135 h

Language of instruction:

Finnish

Timing:

Periods 1-2, autumn term.

Learning outcomes:

After the course, the student is able to select the most suitable heat treatment process and to give the main characteristics of the heat treating parameters for achieving the required properties such as yield/tensile strength, ductility, toughness, surface hardness and/or fatigue strength. He/she is also able to explain the metallurgical phenomena occurring in a sample during heat treatment. In the area of welding technology, 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 weld joint properties, weld defects and their inspection, 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:

Heat treating and welding processes, their applicability.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures (32 h) will take place during period 3, and the three laboratory exercises in small groups will be during periods I – II. The final grade is based on the points from the final exam or small exams.

Prerequisites and co-requisites:

465101A Introduction to Materials for Mechanical Engineering; 465102A Materials for mechanical Engineering.

Recommended or required reading:

Lecture handouts (in Finnish) and other given materials.

Assessment methods and criteria:

Midterm exams or one final exam is required and accepted exercises. The laboratory exercises will be graded as pass/fail.

Grading:

Numerical grading scale 1-5.

Person responsible:

Timo Kauppi

A460122: Module Preparing for the Option, Machine Design, 40 op

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

Ei opintojaksokuvauksia.

e4

462102A: Machine automation actuators, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Louhisalmi, Yrjö Aulis

Opintokohteen kielet: Finnish

Leikkaavuudet:

462021A-01	Machine Automation I, examination	0.0 op
462021A-02	Machine Automation I, exercise work	0.0 op
462021A	Machine Automation I	5.0 op
464064A	Actuators	5.0 op

ECTS Credits:

5 cr / 133 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the autumn semester, during periods 3 and 4. It is recommended to complete the course at the 2nd spring semester.

Learning outcomes:

After completing the course the student can explain the role of actuators in machine automation systems. The student recognizes different types of actuators and can categorize them eg. based on performance and usage limitations. The student is able to design a simple actuator operation and is able to select suitable actuators for a typical automation application. In addition, the student is able to evaluate the sensing needs and operating conditions of actuators as part of the automation system.

Contents:

Basics actuators; Basics of hydraulics, Pneumatics and electrical drives; Performance and efficiency of actuators; Hydraulic actuators; Pneumatic actuators; Electrical actuators.

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

Lectures 32 h / Group work 16 h / Self-study 85 h

Target group:

Bachelor's degree students of mechanical 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 materials. Other material is in the beginning of the course.

Assessment methods and criteria:

This course utilizes continuous assessment. The assessment can be based on learning diary, homework, exercises, seminars and exam.

Grading:

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

Person responsible:

University teacher Yrjö Louhisalmi

464103A: Machine design, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Niskanen, Juhani

Opintokohteen kielet: Finnish

Leikkaavuudet:

464056A Machine Design II 6.0 op

464056A-01 Machine Design II, examination 0.0 op

464056A-02 Design II, exercise 0.0 op

464062S Engineering Design 20.0 op

ECTS Credits:

5 ects / 133 hours of studying work.

Language of instruction:

Finnish, can be completed in English as a book examination

Timing:

Lectures spring period 3 and 4.

Learning outcomes:

Upon completion of this course, the student is able, asa 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. Student is also able to design new product or essentially improve old product. Student knows what is required when working as a part of a product development project.

Contents:

Advanced machine design, design of assemplies and design methods. Utilization of Automation and new materials. Meaning of a machine directive.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 40 h / practical work 93 h.

Target group:

3rd year mechanical engineering students

Prerequisites and co-requisites:

Design of machine elements, Engineering drawing and CAD.

Recommended optional programme components:

The course of study is an independent entity and does not require other studies to be completed simultaneously.

Recommended or required reading:

Björk, T.& al. Koneenosien suunnittelu. WSOY, Porvoo, 2014; Shigley, J. E. ja Mischke, C. R. Mechanical Engineering Design. New York, McGraw-Hill,1983. Tuomaala, J. Koneensuunnitteluoppi, first part. Oulu, 1995. Tuomaala, J. : Koneensuunnitteluoppi, later part, Oulu, 1995. Dieter, G.E. : Engineering Design, McGraw-Hill: New York, 2000.

Assessment methods and criteria:

Final Exam and practical work. Final exam is 50% and practical work 50% of final grade

Grading:

Numerical grading scale 1-5 / fail

Person responsible:

Professor Juhani Niskanen

464104A: Product innovations, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Niskanen, Juhani

Opintokohteen kielet: Finnish

Leikkaavuudet:

464085A-01	Patenting, examination	0.0 op
464085A-02	Patenting, exercise	0.0 op
464061A-01	Techniques of Creative Working, examination	0.0 op
464061A-02	Techniques of Creative Work, design exercise	0.0 op
464085A	Patenting	3.5 op
464061A	Techniques of Creative Working	3.0 op

ECTS Credits:

5 ects / 133 hours of studying work.

Language of instruction:

Finnish, can be completed in English as a book examination

Timing:

Lectures arranged autumn during period 1, Practical work during course.

Learning outcomes:

The objective of the course for the student is to learn to find problems in familiar environment, analyze them and implement mechanical engineering to solve the problems. 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. Student can develop solution as far as it is protectable with patenting. The main emphasis is on patenting; how to protect valuable product design from imitation; and how to avoid infringement of competitors' industrial property rights. Upon completion of the course, the student can explain conditions for a patentable design and compare patenting to other ways of protecting industrial rights and is able to make an application for patent. The student also knows employer's and employee's rights in case of making an invention as an employee.

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. Product protection models and their use in competition; Comprehension and legitimacy of the protection by patent; Applying for patent and making an application for a patent; Applying for a patent in a foreign country;
Situations involving a conflict; Patent legislation.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 30 h / practical work 60 h.

Target group:

Bachelor degree students of mechanical engineering

Recommended or required reading:

Copies of lecture material.

Assessment methods and criteria:

Final exam and practical work. Both are 50% of final grade.

Grading:

Numerical grading scale 1-5 / fail

Person responsible:

Professor Juhani Niskanen

461107A: Finite Element Methods I, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Lumijärvi, Jouko Veikko Juhani

Opintokohteen kielet: Finnish

Leikkaavuudet:

461033A	Finite Element Methods I	3.5 op
461033A-01	Finite Element Methods I, examination	0.0 op
461033A-02	Finite Element Methods I, exercises	0.0 op

ECTS Credits:

5 ECTS credits / 132 hours of work

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. After this course, the student can explain the basic idea of the FEM. He/she can analyze simple truss-, frame- and plane structures and explain the theoretical background of the calculations.

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.-2.

Target group:

Students of the bachelor's stage of the Mechanical Engineering Degree Programme.

Prerequisites and co-requisites:

Strength of Materials I and II and Fundamentals of mechanical computing and programming

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:

The grade of the course is based on a final exam. The student must pass the exercises before taking the examination.

Grading:

Numerical grading scale 1-5.

Person responsible:

Jouko Lumijärvi

462104A: Machine automation, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Louhisalmi, Yrjö Aulis

Opintokohteen kielet: Finnish

Leikkaavuudet:

462022S-01	Machine Automation II, examination	0.0 op
462022S-02	Machine Automation II, exercise work	0.0 op
462022S	Machine Automation II	5.0 op

ECTS Credits:

5 cr / 133 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the autumn semester, during periods 1 and 2. It is recommended to complete the course at the 3rd autumn semester.

Learning outcomes:

Upon completion of the course, the student will be able to explain the basic principles and structures of a typical machine automation system. The student is able to divide an automation system into basic elements and explain their role and significance in the system. The student can apply the basic digital technology and logic methods in designing a typical machine automation system. In addition to this, the student knows the operating principles of programmable logic controllers (PLCs) and is able to implement a logic control for a typical application. Furthermore, the student is able to explain the basic principles of fieldbuses. The students also knows the basics of machine automation safety design.

Contents:

Basics of automation; Basics of digital technology and logic; Description of operation sequences; Architecture of programmable logic controllers and their programming; Distributed systems and fieldbuses.

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

Lectures 32 h / Group work 16 h / Self-study 85 h

Target group:

Bachelor's degree students of mechanical engineering

Prerequisites and co-requisites:

The recommended prerequisite is the completion of the following courses prior to enrolling for the course: Actuators in Machine Automation, Elementary Programming

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time. However, it is recommended to complete the course Machine Sensor Technology simultaneously.

Recommended or required reading:

Lecture material. Other material is in the beginning of the course.

Assessment methods and criteria:

This course utilizes continuous assessment. The assessment can be based on learning diary, homework, exercises, seminars and exam.

Grading:

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

Person responsible:

University teacher Yrjö Louhisalmi

462107A: Maintenance of machines, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jouni Laurila

Opintokohteen kielet: Finnish

Leikkaavuudet:

464087A-01	Maintenancy Technology, examination	0.0 op
464087A-02	Maintenancy Technology, exercise work	0.0 op
464087A	Maintenancy Technology	5.0 op

ECTS Credits:

5 ECTS credits / 135 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the spring semester, during period 4. It is recommended to complete the course at the 3rd spring semester.

Learning outcomes:

After completing the course, the student will be familiar with the principles and most common methods of implementing fitness based maintenance. They are able to explain the importance of running in production and apply the most important standards in the field of maintenance. different types of maintenance and can tell you what aspects of choosing a maintenance strategy. The student knows how to name the most common machine failure methods and the consequences of failure and can tell how to prevent failure in typical situations. The student recognizes the effects of wear and lubrication on the condition of machines and is able to explain the basic concepts related to lubricant analysis. The student knows how to use the most common methods used in machine condition monitoring and how to use them. He / she can explain the basics of vibration measurements and can choose appropriate measurement and analysis methods to identify the most common machine failures. The student knows the importance of running in production and is able to apply the most important standards in the field of maintenance.

Contents:

Condition based maintenance, failure, wear and lubrication, common condition monitoring methods, basics of performing vibration measurements, analyzing and signal processing, common rotating machine failure detection, vibration intensity estimation, rotor dynamic balancing, machine design and condition, machine design and condition management. failure, wear and lubrication, machine condition monitoring basics and common methods.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 24 h / group work 50 h / self-study 61 h

Target group:

Bachelor's degree students in the mechanical engineering

Prerequisites and co-requisites:

The recommended prequisite is the completion of the following course: 462103A Introduction to Maintenance

Recommended optional programme components:

The course is an independent entity

Recommended or required reading:

Luentomoniste ja muu kurssin aikana jaettava materiaali. Oheiskirjallisuus: Järviö, J. & Lehtiö. T., Kunnossapito: tuotanto-omaisuuden hoitaminen. Helsinki, KP-Media Oy 2012. Antila, K., et al., Teollisuusvoitelu, KP-Media Oy, 2003. Mikkonen, H. (toim.), Kuntoon perustuva kunnossapito, KP-Media Oy, 2009.

Assessment methods and criteria:

Final examination and the other graded assignments

Grading:

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

Person responsible:

Jouni Laurila

465104A: Heat treatment and welding of metals, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Timo Kauppi

Opintokohteen kielet: Finnish

Leikkaavuudet:

465077A-01	Welding Technology, examination	0.0 op
465077A-02	Welding Technology, exercises	0.0 op
465077A	Welding Technology	3.5 op

ECTS Credits:

5 cr; study time 135 h

Language of instruction:

Finnish

Timing:

Periods 1-2, autumn term.

Learning outcomes:

After the course, the student is able to select the most suitable heat treatment process and to give the main characteristics of the heat treating parameters for achieving the required properties such as yield/tensile strength, ductility, toughness, surface hardness and/or fatigue strength. He/she is also able to explain the metallurgical phenomena occurring in a sample during heat treatment. In the area of welding technology, 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 weld joint properties, weld defects and their inspection, 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:

Heat treating and welding processes, their applicability.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures (32 h) will take place during period 3, and the three laboratory exercises in small groups will be during periods I – II. The final grade is based on the points from the final exam or small exams.

Prerequisites and co-requisites:

465101A Introduction to Materials for Mechanical Engineering; 465102A Materials for mechanical Engineering.

Recommended or required reading:

Lecture handouts (in Finnish) and other given materials.

Assessment methods and criteria:

Midterm exams or one final exam is required and accepted exercises. The laboratory exercises will be graded as pass/fail.

Grading:

Numerical grading scale 1-5.

Person responsible:

Timo Kauppi

A460123: Module Preparing for the Option, Materials Engineering, 36 op

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

Ei opintojaksokuvauksia.

e5

462102A: Machine automation actuators, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Louhisalmi, Yrjö Aulis
Opintokohteen kielet: Finnish
Leikkaavuudet:

462021A-01	Machine Automation I, examination	0.0 op
462021A-02	Machine Automation I, exercise work	0.0 op
462021A	Machine Automation I	5.0 op
464064A	Actuators	5.0 op

ECTS Credits:

5 cr / 133 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the autumn semester, during periods 3 and 4. It is recommended to complete the course at the 2nd spring semester.

Learning outcomes:

After completing the course the student can explain the role of actuators in machine automation systems. The student recognizes different types of actuators and can categorize them eg. based on performance and usage limitations. The student is able to design a simple actuator operation and is able to select suitable actuators for a typical automation application. In addition, the student is able to evaluate the sensing needs and operating conditions of actuators as part of the automation system.

Contents:

Basics actuators; Basics of hydraulics, Pneumatics and electrical drives; Performance and efficiency of actuators; Hydraulic actuators; Pneumatic actuators; Electrical actuators.

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

Lectures 32 h / Group work 16 h / Self-study 85 h

Target group:

Bachelor's degree students of mechanical 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 materials. Other material is in the beginning of the course.

Assessment methods and criteria:

This course utilizes continuous assessment. The assessment can be based on learning diary, homework, exercises, seminars and exam.

Grading:

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

Person responsible:

University teacher Yrjö Louhisalmi

465104A: Heat treatment and welding of metals, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Timo Kauppi

Opintokohteen kielet: Finnish

Leikkaavuudet:

465077A-01	Welding Technology, examination	0.0 op
465077A-02	Welding Technology, exercises	0.0 op
465077A	Welding Technology	3.5 op

ECTS Credits:

5 cr; study time 135 h

Language of instruction:

Finnish

Timing:

Periods 1-2, autumn term.

Learning outcomes:

After the course, the student is able to select the most suitable heat treatment process and to give the main characteristics of the heat treating parameters for achieving the required properties such as yield/tensile strength, ductility, toughness, surface hardness and/or fatigue strength. He/she is also able to explain the metallurgical phenomena occurring in a sample during heat treatment. In the area of welding technology, 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 weld joint properties, weld defects and their inspection, 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:

Heat treating and welding processes, their applicability.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures (32 h) will take place during period 3, and the three laboratory exercises in small groups will be during periods I – II. The final grade is based on the points from the final exam or small exams.

Prerequisites and co-requisites:

465101A Introduction to Materials for Mechanical Engineering; 465102A Materials for mechanical Engineering.

Recommended or required reading:

Lecture handouts (in Finnish) and other given materials.

Assessment methods and criteria:

Midterm exams or one final exam is required and accepted exercises. The laboratory exercises will be graded as pass/fail.

Grading:

Numerical grading scale 1-5.

Person responsible:

Timo Kauppi

465106A: Basics of corrosion in metals, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jussi Paavola

Opintokohteen kielet: Finnish

ECTS Credits:

5 ects/135 hours study time

Language of instruction:

Finnish

Timing:

Lectures and laboratory works, 3. and 4. periods

Learning outcomes:

After the course, the student has the knowledge of corrosion when analyzing possibilities of corrosion in certain environments. In addition, the student is able to classify corrosion modes occurring in different metals and to select a suitable corrosion protection method for iron based metals.

Contents:

Corrosion mechanisms in metal alloys and corrosion protection techniques of metal alloys.

Mode of delivery:

Face-to face teaching

Learning activities and teaching methods:

32 hours lectures/ 4 hours laboratory exercises/ 99 hours independent studies. A laboratory exercise is included in the course.

Recommended or required reading:

Lecture handouts (In Finnish). Other material will be announced at the beginning of the course.

Assessment methods and criteria:

Final exam. The final grade is based on the final exam.

Grading:

Numerical grading scale 1 - 5. A laboratory exercise will be graded as "pass"/"fail".

Person responsible:

Jussi Paavola

465105A: Research techniques for materials, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Anna Kisko

Opintokohteen kielet: Finnish

Leikkaavuudet:

465075A	Research Techniques for Materials	3.5 op

ECTS Credits:

5 ects/ 135 hours study time

Language of instruction:

Finnish

Timing:

Lectures and laboratory work, 2. period

Learning outcomes:

This course gives an introduction to the broad spectrum of experimental techniques used in materials research, excluding materials testing. The principles, advantages and limitations of the various methods and their field of applications are described. Upon completing of the required coursework, the student can explain the structure, functioning and contrast formation as well as factors affecting the resolution of various metal microscopes. The student is also able to explain the concepts of the thermal analysis, dilatometry, and magnetic and electrical measurements and list typical applications for these techniques and methods.

Contents:

Optical microscopy, scanning electron microscope (SEM), microanalysis techniques (EDS and WDS), atom force microscopy, dilatometry, thermal analysis techniques, magnetic measurement techniques, surface analysis techniques, and bulk analysis techniques.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

32 hours lectures/ 12 hours laboratory exercises/91 hours independent studies. Three laboratory excersises are included in the course.

Target group:

Mandatory at the Bachelor stage for all students of the Materials Engineering study option of the Mechanical Engineering Degree Programme.

Recommended or required reading:

Lecture handout and other material to be reported in lectures.

Assessment methods and criteria:

The grade of the course is determined by the final exam (weight factor 0.7) and the final report (weight factor 0.3).

Grading:

Numerical grading scale 1 - 5

Person responsible:

Anna Kisko

465103A: Principles of metal shaping and forming, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jari Larkiola

Opintokohteen kielet: Finnish

Leikkaavuudet:

465095A-01	Sheet Metal Forming	0.0 op
465095A-02	Sheet Metal Forming, literature review	0.0 op
465095A	Sheet Metal Forming	3.5 op

ECTS Credits:

5 / 135 h total study time

Language of instruction:

Finnish

Timing:

Autumn semester, periods 1 & 2. Recommended for the third study year.

Learning outcomes:

The student understands the basics of hot and cold forming of metals and their effects on the mechanical properties and usability of metals in different loading environments. After completing the course, the student will be able to evaluate the various shaping and shaping methods and make the right choices for the effective manufacturing of the desired product. The student is able to compare different methods.

Contents:

The forming processes include hot forming methods such as rolling, forging, extrusion, rod and wire drawing, and cold forming of thin sheets. In addition, it is taught how to incorporate the results of metal material testing tests into the models presented in plasticity theories. The theory of plasticity explores the most common constitutive material models and their application to different metals.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures, literature study and examination

Target group:

Compulsory in the Bachelor's stage for all Mechanical Engineering students majoring in Materials Engineering.

Prerequisites and co-requisites:

Before registering for this course the student must have successfully completed the following courses: 465101A An Introduction to Materials for Mechanical Engineering, 465102A Materials for Mechanical Engineering

Recommended or required reading:

Lecture notes, Korhonen, A. and Larkiola, J., Ohutlevyjen muovauksen perusteet, Actaoulu C1 2012, 207p

Assessment methods and criteria:

Final grade assessed on the basis of a final examination (80%) and literature work (20%).

Grading:

Examination scale 0-5 ja literature work 0-2. Grade 0 fail.

Person responsible:

Jari Larkiola.

463105A: Casting techniques, 8 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jouko Heikkala

Opintokohteen kielet: Finnish

Leikkaavuudet:

463065A-01	Manufacturing of plastic products, examination	0.0 op
463065A-02	Manufacturing of plastic products, exercise work	0.0 op
463058A-01	Foundry Technology, examination	0.0 op
463058A-02	Foundry Technology, exercises	0.0 op
463058A-03	Foundry technology, laboratory exercise	0.0 op
463058A	Foundry Technology	3.5 op
463065A	Manufacturing of Plastics Products	3.5 op

ECTS Credits:

8 ECTS

Language of instruction:

Finnish

Timing:

The course is scheduled for the autumn semester, 1st and 2nd period.

Learning outcomes:

The aim of the course is to give the students basic information concerning casting processes in manufacturing and how they are applied to different kinds of production and materials and also what those methods require for product design. After completing the course the student can estimate which kinds of products are possible and profitable to make by casting. The student can name the main principles of common casting methods and how those methods suit to different kinds of products, materials and various sizes. The student knows the most common metallic and plastic materials and the suitable casting methods for those. The student can also explain the main steps of the process plan and casting system design.

Contents:

Different types of patterns and moulds. Molding, casting and melting methods. Cast metals and plastics. Parts post-processing. Design of cast part and process. Main types, properties and use of technical plastics. Injection molding and special applications. Other plastic part manufacturing methods. Design of cast product. Tool and die design and manufacturing. The use of computer-aided design tools and additive manufacturing.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures and exercises, examination.

Target group:

Students of the Bachelor stage of the Mechanical Engineering Degree Programme.

Recommended or required reading:

Lectures; News articles and web pages (given in lectures). Autere, Ingman, Tennilä: Valimotekniikka I ja II; Ihalainen-Aaltonen-Aromäki-Sihvonen: Valmistustekniikka. Valutekniikka, s. 59-88
Valuatlas: https://www.valuatlas.fi/
Virtuaaliyliopisto; Muoviteknologia: http://www.uiah.fi/virtu/materiaalit/muoviteknologia/
Muoviteollisuus ry: http://www.muoviteollisuus.fi/opetusmateriaalit/muovien_ihmeellinen_maailma/ Muovinetti: https://muovinetti.com/hyva-tietaa-muovista/
Suomen valimotekninen yhdistys: http://www.svy.info/

Assessment methods and criteria:

Examination and exercises are graded 1-5. The final grade is determined 30% by the exercises and 70% by the examination.

Grading:

Numerical grading scale 1-5.

Person responsible:

Jouko Heikkala

A460124: Module Preparing for the Option, Mechactronics and Machine Diagnostics, 40,5 op

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

Ei opintojaksokuvauksia.

e6

462102A: Machine automation actuators, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Louhisalmi, Yrjö Aulis
Opintokohteen kielet: Finnish
Leikkaavuudet:

462021A-01	Machine Automation I, examination	0.0 op
462021A-02	Machine Automation I, exercise work	0.0 op
462021A	Machine Automation I	5.0 op
464064A	Actuators	5.0 op

ECTS Credits:

5 cr / 133 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the autumn semester, during periods 3 and 4. It is recommended to complete the course at the 2nd spring semester.

Learning outcomes:

After completing the course the student can explain the role of actuators in machine automation systems. The student recognizes different types of actuators and can categorize them eg. based on performance and usage limitations. The student is able to design a simple actuator operation and is able to select suitable actuators for a typical automation application. In addition, the student is able to evaluate the sensing needs and operating conditions of actuators as part of the automation system.

Contents:

Basics actuators; Basics of hydraulics, Pneumatics and electrical drives; Performance and efficiency of actuators; Hydraulic actuators; Pneumatic actuators; Electrical actuators.

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

Lectures 32 h / Group work 16 h / Self-study 85 h

Target group:

Bachelor's degree students of mechanical 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 materials. Other material is in the beginning of the course.

Assessment methods and criteria:

This course utilizes continuous assessment. The assessment can be based on learning diary, homework, exercises, seminars and exam.

Grading:

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

Person responsible:

University teacher Yrjö Louhisalmi

462105A: Machine Sensor Technology, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Liedes, Toni Mikael

Opintokohteen kielet: Finnish

Leikkaavuudet:

462053A Sensor Technology of Machine Automation 5.0 op

ECTS Credits:

5 cr / 133 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the autumn semester, during periods 1 and 2. It is recommended to complete the course at the 3rd autumn semester.

Learning outcomes:

Upon completion of the course, the student will be able identify, classify and bring into use the most common sensor types used in machine automation. The student is able to choose sensors for typical automation applications. In addition to this, the student is able to design a common analog and digital signal transmission and conditioning chain.

Contents:

Basics measuring systems; Classification of sensors; Characteristics of analog and digital domain; Analog to digital conversion; Basics of analog signal conditioning: amplification, attenuation and filtering; Operating principle of digital sensors; Examples of typical sensors used in mechanical engineering and civil engineering;

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

Lectures 32 h / Group work 16 h / Self-study 85 h

Target group:

Bachelor's degree students of mechanical engineering

Prerequisites and co-requisites:

The recommended prerequisite is the completion of the following courses prior to enrolling for the course: Actuators in Machine Automation

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:

de Silva, Clarence W. Mechatronics: An Integrated Approach. CRC Press, 2005, 1312 p. Chapters 4-7; Lecture notes.

Assessment methods and criteria:

This course utilizes continuous assessment. The assessment can be based on learning diary, exercises, seminars and exam.

Grading:

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

Person responsible:

Lecturer Toni Liedes

462104A: Machine automation, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Louhisalmi, Yrjö Aulis

Opintokohteen kielet: Finnish

Leikkaavuudet:

462022S-01	Machine Automation II, examination	0.0 op
462022S-02	Machine Automation II, exercise work	0.0 op
462022S	Machine Automation II	5.0 op

ECTS Credits:

5 cr / 133 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the autumn semester, during periods 1 and 2. It is recommended to complete the course at the 3rd autumn semester.

Learning outcomes:

Upon completion of the course, the student will be able to explain the basic principles and structures of a typical machine automation system. The student is able to divide an automation system into basic elements and explain their role and significance in the system. The student can apply the basic digital technology and logic methods in designing a typical machine automation system. In addition to this, the student knows the operating principles of programmable logic controllers (PLCs) and is able to implement a logic control for a typical application. Furthermore, the student is able to explain the basic principles of fieldbuses. The students also knows the basics of machine automation safety design.

Contents:

Basics of automation; Basics of digital technology and logic; Description of operation sequences; Architecture of programmable logic controllers and their programming; Distributed systems and fieldbuses.

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

Lectures 32 h / Group work 16 h / Self-study 85 h

Target group:

Bachelor's degree students of mechanical engineering

Prerequisites and co-requisites:

The recommended prerequisite is the completion of the following courses prior to enrolling for the course: Actuators in Machine Automation, Elementary Programming

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time. However, it is recommended to complete the course Machine Sensor Technology simultaneously.

Recommended or required reading:

Lecture material. Other material is in the beginning of the course.

Assessment methods and criteria:

This course utilizes continuous assessment. The assessment can be based on learning diary, homework, exercises, seminars and exam.

Grading:

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

Person responsible:

University teacher Yrjö Louhisalmi

462106A: Precision engineering, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Louhisalmi, Yrjö Aulis

Opintokohteen kielet: English

Leikkaavuudet:

462038A-01	Precision Engineering, examination	0.0 op
462038A-02	Precision Engineering, exercise work	0.0 op
462038A	Precision Engineering	3.5 op

ECTS Credits:

5 cr / 133 hours of work

Language of instruction:

English

Timing:

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

Learning outcomes:

Upon completion of the course, the student can analyze structures and components used in precise engineering products, can explain working principles of them and can design new qualified and easily manufactured precise engineering products.

Contents:

Introduction, design of precision mechanical devices, enclosure and usability of devices, fixed and removable joints, implementation of rotary and linear motion, and the most common precision and micromechanical manufacturing methods.

Mode of delivery:

Blended teaching. The course is lectured in English, possible exercises are taught face to face. Final exam in English.

Learning activities and teaching methods:

Lectures 28 h / group working 15 h / independent studying 90 h

Target group:

Bachelor's Degree students in Mechatronics and machine diagnostics and Master's degree students of Mechanical engineering.

Recommended optional programme components:

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). Additional literature: Krause, W.: Grundlagen der konstruktion, elektronik, elektrotechnik, feinwerktechnik, 7 aufl., Hanser, 1994; Ullman, D.: The mechanical design process, 3. ed., Mac-Graw-Hill, 2003.

Assessment methods and criteria:

The course uses continuous assessment. The overall grade may be determined, for example, by the weighted average of the learning diary, homework, assignments, seminars, and exam.

Grading:

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

Person responsible:

University teacher Yrjö Louhisalmi

464103A: Machine design, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Niskanen, Juhani

Opintokohteen kielet: Finnish

Leikkaavuudet:

464056A	Machine Design II	6.0 op
464056A-01	Machine Design II, examination	0.0 op
464056A-02	Design II, exercise	0.0 op
464062S	Engineering Design	20.0 op

ECTS Credits:

5 ects / 133 hours of studying work.

Language of instruction:

Finnish, can be completed in English as a book examination

Timing:

Lectures spring period 3 and 4.

Learning outcomes:

Upon completion of this course, the student is able, asa 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. Student is also able to design new product or essentially improve old product. Student knows what is required when working as a part of a product development project.

Contents:

Advanced machine design, design of assemplies and design methods. Utilization of Automation and new materials. Meaning of a machine directive.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 40 h / practical work 93 h.

Target group:

3rd year mechanical engineering students

Prerequisites and co-requisites:

Design of machine elements, Engineering drawing and CAD.

Recommended optional programme components:

The course of study is an independent entity and does not require other studies to be completed simultaneously.

Recommended or required reading:

Björk, T.& al. Koneenosien suunnittelu. WSOY, Porvoo, 2014; Shigley, J. E. ja Mischke, C. R. Mechanical Engineering Design. New York, McGraw-Hill,1983. Tuomaala, J. Koneensuunnitteluoppi, first part. Oulu, 1995. Tuomaala, J. : Koneensuunnitteluoppi, later part, Oulu, 1995. Dieter, G.E. : Engineering Design, McGraw-Hill: New York, 2000.

Assessment methods and criteria:

Final Exam and practical work. Final exam is 50% and practical work 50% of final grade

Grading:

Numerical grading scale 1-5 / fail

Person responsible:

Professor Juhani Niskanen

462107A: Maintenance of machines, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jouni Laurila

Opintokohteen kielet: Finnish

Leikkaavuudet:

464087A-01	Maintenancy Technology, examination	0.0 op
464087A-02	Maintenancy Technology, exercise work	0.0 op
464087A	Maintenancy Technology	5.0 op

ECTS Credits:

5 ECTS credits / 135 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the spring semester, during period 4. It is recommended to complete the course at the 3rd spring semester.

Learning outcomes:

After completing the course, the student will be familiar with the principles and most common methods of implementing fitness based maintenance. They are able to explain the importance of running in production and apply the most important standards in the field of maintenance. different types of maintenance and can tell you what aspects of choosing a maintenance strategy. The student knows how to name the most common machine failure methods and the consequences of failure and can tell how to prevent failure in typical situations. The student recognizes the effects of wear and lubrication on the condition of machines and is able to explain the basic concepts related to lubricant analysis. The student knows how to use the

most common methods used in machine condition monitoring and how to use them. He / she can explain the basics of vibration measurements and can choose appropriate measurement and analysis methods to identify the most common machine failures. The student knows the importance of running in production and is able to apply the most important standards in the field of maintenance.

Contents:

Condition based maintenance, failure, wear and lubrication, common condition monitoring methods, basics of performing vibration measurements, analyzing and signal processing, common rotating machine failure detection, vibration intensity estimation, rotor dynamic balancing, machine design and condition, machine design and condition management. failure, wear and lubrication, machine condition monitoring basics and common methods.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 24 h / group work 50 h / self-study 61 h

Target group:

Bachelor's degree students in the mechanical engineering

Prerequisites and co-requisites:

The recommended prequisite is the completion of the following course: 462103A Introduction to Maintenance

Recommended optional programme components:

The course is an independent entity

Recommended or required reading:

Luentomoniste ja muu kurssin aikana jaettava materiaali. Oheiskirjallisuus: Järviö, J. & Lehtiö. T., Kunnossapito: tuotanto-omaisuuden hoitaminen. Helsinki, KP-Media Oy 2012. Antila, K., et al., Teollisuusvoitelu, KP-Media Oy, 2003. Mikkonen, H. (toim.), Kuntoon perustuva kunnossapito, KP-Media Oy, 2009.

Assessment methods and criteria:

Final examination and the other graded assignments

Grading:

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

Person responsible:

Jouni Laurila

521141P: Elementary Programming, 5 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Mika Oja

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay521141P	Elementary Programming (OPEN UNI)	5.0 op

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ECTS Cr

Language of instruction:

Lectures and learning material are in Finnish. The course is not available English.

Timing:

Fall, periods 1-2.

Learning outcomes:

1. Is capable of solving problems in the computer's terms

2. Understands the basic concepts of programming

3. Knows the basics of the Python programming language

4. Is able to implement programs independently

5. Is able to use the internet to find information about programming

Contents:

Problem solving with programming, basic concepts of programming, writing Python code.

Mode of delivery:

Web-based teaching + face-to-face teaching

Learning activities and teaching methods:

30h of exercise groups, 105h self-studying in the web.

Target group:

1 st year students of computer science and engineering, electrical engineering, medical and wellness technology and industrial and engineering management, 2nd year students of physics, 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:

Web material in an online learning environment. Address will be announced at the beginning of the course.

Assessment methods and criteria:

The course is completed by passing all learning assignments, programming exercises and a final exercise project. Read more about assessment criteria at the University of Oulu webpage
Read more about assessment criteria at the University of Oulu webpage.

Grading:

pass/fail.

Person responsible:

Mika Oja

Working life cooperation:

-

Other information:

The course learning platform is Lovelace (lovelace.oulu.fi)

A460126: Module Preparing for the Option, Engineering Mechanics, 37,5 op

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

Ei opintojaksokuvauksia.

e8

462102A: Machine automation actuators, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Louhisalmi, Yrjö Aulis

Opintokohteen kielet: Finnish

Leikkaavuudet:

462021A-01	Machine Automation I, examination	0.0 op
462021A-02	Machine Automation I, exercise work	0.0 op
462021A	Machine Automation I	5.0 op
464064A	Actuators	5.0 op

ECTS Credits:

5 cr / 133 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the autumn semester, during periods 3 and 4. It is recommended to complete the course at the 2nd spring semester.

Learning outcomes:

After completing the course the student can explain the role of actuators in machine automation systems. The student recognizes different types of actuators and can categorize them eg. based on performance and usage limitations. The student is able to design a simple actuator operation and is able to select suitable actuators for a typical automation application. In addition, the student is able to evaluate the sensing needs and operating conditions of actuators as part of the automation system.

Contents:

Basics actuators; Basics of hydraulics, Pneumatics and electrical drives; Performance and efficiency of actuators; Hydraulic actuators; Pneumatic actuators; Electrical actuators.

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

Lectures 32 h / Group work 16 h / Self-study 85 h

Target group:

Bachelor's degree students of mechanical 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 materials. Other material is in the beginning of the course.

Assessment methods and criteria:

This course utilizes continuous assessment. The assessment can be based on learning diary, homework, exercises, seminars and exam.

Grading:

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

Person responsible:

University teacher Yrjö Louhisalmi

461107A: Finite Element Methods I, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Lumijärvi, Jouko Veikko Juhani

Opintokohteen kielet: Finnish

Leikkaavuudet:

461033A Finite Element Methods I 3.5 op

461033A-01 Finite Element Methods I, examination 0.0 op

461033A-02 Finite Element Methods I, exercises 0.0 op

ECTS Credits:

5 ECTS credits / 132 hours of work

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. After this course, the student can explain the basic idea of the FEM. He/she can analyze simple truss-, frame- and plane structures and explain the theoretical background of the calculations.

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.-2.

Target group:

Students of the bachelor's stage of the Mechanical Engineering Degree Programme.

Prerequisites and co-requisites:

Strength of Materials I and II and Fundamentals of mechanical computing and programming

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:

The grade of the course is based on a final exam. The student must pass the exercises before taking the examination.

Grading:

Numerical grading scale 1-5.

Person responsible:

Jouko Lumijärvi

461109A: Finite element methods II, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Lumijärvi, Jouko Veikko Juhani

Opintokohteen kielet: Finnish

Leikkaavuudet:

461034A	Finite Element Methods II	3.5 op
461034A-01	Finite Element Methods II, examination	0.0 op
461034A-02	Finite Element Methods II, exercises	0.0 op

ECTS Credits:

5 ECTS credits / 132 hours of work

Language of instruction:

Finnish

Timing:

Lectures and exercises, periods 3.-4.

Learning outcomes:

The aim of this course is for students to gain an understanding of the basic idea and restrictions of FEM in dynamic and buckling analyses and the preparedness to use commercial FE-programs.
After this course, the student can explain the basic idea of the FEM in the case of two- and three dimensional, geometrically complicated structures. In addition to the linear displacement and heat transfer problems, he/she is able to critically utilize the ready to use FEM-programs in the analysis of buckling-, modal- and dynamic problems. Also, the student knows the basic types of nonlinearity and recognizes their effect on the computations.

Contents:

Shell and solid elements. Buckling and modal analyses. Dynamic analyses. An introduction to the nonlinearities.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures and exercises take place during periods 3.-4. The course can be passed by completing a final exam.

Target group:

Degree Programme in Mechanical Engineering students.

Prerequisites and co-requisites:

Strength of Materials I and II, Finite Element Methods I.

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. NAFEMS: A Finite Element Dynamics Primer, NAFEMS: Introduction to Nonlinear Finite Element Analysis.

Assessment methods and criteria:

The grade of the course is based on a final exam. The student must pass the exercises before taking the examination.

Grading:

Numerical grading scale 1-5.

Person responsible:

Jouko Lumijärvi

461108A: Mechanics of materials, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Koivurova Hannu

Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS credits / 90 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the Autumn semester, during periods 1 and 2. It is recommended to complete the course at the 3rd autumn semester.

Learning outcomes:

Upon completing the required coursework, the student knows the theoretical background of the strength of materials and he/she is able to apply the theory of the strength of materials to different kind of design problems needed in engineering mechanics. He/she understand the fundamental concepts of mechanics of deformable solids; including static equilibrium, geometry of deformation, and material constitutive behavior. He/she can discuss the basic mechanical principles underlying modern approaches for modelling of various types of materials under a different type of loadings. This provide students with exposure to the systematic methods for solving engineering problems in solid mechanics. He/she can also build the necessary theoretical background for further structural analysis and design courses.

Contents:

The general equations of mechanics. The stress and strain state. Different material models; Linear elastic material, isotropic, transverse-isotropic and orthotropic material models. The concept of strain energy. Theory of plasticity. Yield criterion, plastic flow rule and hardening. Limit state design. Introduction to visco elastic material and creep teory.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 30 h / Exercise 30 h / Self-study 30 h.

Target group:

Students of the Bachelor Stage of the Mechanical Engineering Degree Programme

Prerequisites and co-requisites:

Recommended: Strength of Materials I and II and the knowledge of vector and matrix calculations.

Recommended optional programme components:

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

Recommended or required reading:

Salmi, T., Virtanen, S. (2008) Materiaalien Mekaniikka. Pressus Oy.

Assessment methods and criteria:

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

Grading:

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

Person responsible:

University Lecturer Hannu Koivurova

464103A: Machine design, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Niskanen, Juhani

Opintokohteen kielet: Finnish

Leikkaavuudet:

464056A	Machine Design II	6.0 op
464056A-01	Machine Design II, examination	0.0 op
464056A-02	Design II, exercise	0.0 op
464062S	Engineering Design	20.0 op

ECTS Credits:

5 ects / 133 hours of studying work.

Language of instruction:

Finnish, can be completed in English as a book examination

Timing:

Lectures spring period 3 and 4.

Learning outcomes:

Upon completion of this course, the student is able, asa 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. Student is also able to design new product or essentially improve old product. Student knows what is required when working as a part of a product development project.

Contents:

Advanced machine design, design of assemplies and design methods. Utilization of Automation and new materials. Meaning of a machine directive.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 40 h / practical work 93 h.

Target group:

3rd year mechanical engineering students

Prerequisites and co-requisites:

Design of machine elements, Engineering drawing and CAD.

Recommended optional programme components:

The course of study is an independent entity and does not require other studies to be completed simultaneously.

Recommended or required reading:

Björk, T.& al. Koneenosien suunnittelu. WSOY, Porvoo, 2014; Shigley, J. E. ja Mischke, C. R. Mechanical Engineering Design. New York, McGraw-Hill,1983. Tuomaala, J. Koneensuunnitteluoppi, first part. Oulu, 1995. Tuomaala, J. : Koneensuunnitteluoppi, later part, Oulu, 1995. Dieter, G.E. : Engineering Design, McGraw-Hill: New York, 2000.

Assessment methods and criteria:

Final Exam and practical work. Final exam is 50% and practical work 50% of final grade

Grading:

Numerical grading scale 1-5 / fail

Person responsible:

Professor Juhani Niskanen

031022P: Numerical Analysis, 5 op

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Applied Mathematics and Computational Mathematics

Arvostelu: 1 - 5, pass, fail

Opettajat: Marko Huhtanen

Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS credits / 135 hours of work

Language of instruction:

Finnish. English speaking students should contact the instructor.
The course can be completed in English by intermediate exams or by a final exam.

Timing:

Spring semester, period 3

Learning outcomes:

Knows numerical algorithms for solving basic problems in computing. Knows basics about numerical linear algebra and some of its applications. Knows how nonlinear systems are solved and how they appear in optimization. Knows how differential equations are solved numerically.

Contents:

Numerical linear algebra, numerical methods for systems of equations, unconstrained optimization, basics of the approximation theory, numerical quadratures, numerical methods for ordinary differential equations.

Mode of delivery:

Online teaching

Learning activities and teaching methods:

Lectures 28 h / Group work 22 h / Self-study 85 h.

Target group:

-

Prerequisites and co-requisites:

Completion of courses Calculus I and II, a course on Differential Equations and a Course on Linear Algebra.

Recommended optional programme components:

-

Recommended or required reading:

Material posted on the web-page of the course.

Assessment methods and criteria:

Intermediate exams or a final exam. The exams are remote exams. It is possibility to take exams also at the university.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

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

Person responsible:

Marko Huhtanen

Working life cooperation:

-

A460128: Module Preparing for the Option, Production Technology, 37 op

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

Ei opintojaksokuvauksia.

e10

462102A: Machine automation actuators, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Louhisalmi, Yrjö Aulis
Opintokohteen kielet: Finnish
Leikkaavuudet:

462021A-01	Machine Automation I, examination	0.0 op
462021A-02	Machine Automation I, exercise work	0.0 op
462021A	Machine Automation I	5.0 op
464064A	Actuators	5.0 op

ECTS Credits:

5 cr / 133 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the autumn semester, during periods 3 and 4. It is recommended to complete the course at the 2nd spring semester.

Learning outcomes:

After completing the course the student can explain the role of actuators in machine automation systems. The student recognizes different types of actuators and can categorize them eg. based on performance and usage limitations. The student is able to design a simple actuator operation and is able to select suitable actuators for a typical automation application. In addition, the student is able to evaluate the sensing needs and operating conditions of actuators as part of the automation system.

Contents:

Basics actuators; Basics of hydraulics, Pneumatics and electrical drives; Performance and efficiency of actuators; Hydraulic actuators; Pneumatic actuators; Electrical actuators.

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

Lectures 32 h / Group work 16 h / Self-study 85 h

Target group:

Bachelor's degree students of mechanical 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 materials. Other material is in the beginning of the course.

Assessment methods and criteria:

This course utilizes continuous assessment. The assessment can be based on learning diary, homework, exercises, seminars and exam.

Grading:

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

Person responsible:

University teacher Yrjö Louhisalmi

463103A: Quality in production and dimensional measurements, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Pirkola, Heikki Juhani

Opintokohteen kielet: Finnish

Leikkaavuudet:

463062S-01	Quality in prod, exam	0.0 op
463062S-02	Quality in Prod, exam	0.0 op
463062S	Quality in Production	3.5 op

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the autumn semester, during period 1 and 2. It is recommended to complete the course at the 3rd autumn semester.

Learning outcomes:

Quality in Production is the supplementary course for the students graduating in the field of Functions of Management in Industry. The aim of this course is to understand the effects of a comprehensive quality control on the functions and costs of an enterprise and the principles of realization of quality assurance Learning Outcomes: Upon completion of the course, the student is able to specify the concept of quality, explain the quality control in different phases of production and explain how it is possible to realize quality assurance by using different methods and principles of quality assurance. In addition, the student is able to explain the principle of quality system and to plan the quality system according to the requirements of quality standards. The student can explain the use of measuring instruments needed in workshop quality assurance.

Contents:

Concept of quality; TQC managing philosophy; Quality control in different phases of production; Quality costs; Methods of quality assurance; Quality system of a company; Quality policy in subcontracting; Quality circles.;SFS-ISO 9000 quality standards.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

The course consists of lectures (20h), exercises (10h), practical work (30h) and shelf-study (73h).

Target group:

Students of the Bachelor Stage of the Mechanical Engineering Degree Programme

Recommended or required reading:

Ishikawa, Kaoru; What is Total Quality Control? Prentice Hall, 1985; Ishikawa, K. Introduction to Quality Control, Chapman & Hall, London, 1990; Shingo, Shigeo; Zero Quality Control; Source Inspection and Poka-Yoke System, Productivity Press, 1986.

Assessment methods and criteria:

Teacher gives instructions at the beginning of the course.

Grading:

Numerical grading scale 1-5.

Person responsible:

Heikki Pirkola

463104A: Advanced manufacturing methods, 7 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jyri Porter

Opintokohteen kielet: Finnish

Leikkaavuudet:

463068S-01	Laser Processing, examination	0.0 op
463068S-02	Laser Processing, exercises and seminari	0.0 op
463068S	Laser Processing	3.5 op

ECTS Credits:

7 cr / 187 hours of work

Language of instruction:

Finnish, the course can also be completed in English

Timing:

Organized during the autumn semester. Lectures and seminar during period 1, demonstrations and practical work during period 2.

Learning outcomes:

The student can apply laser machining processes, electrical discharge machining, abrasive water jet cutting and additive manufacturing processes in today's machine shops as well as choose suitable equipment for various applications. The student can also describe the main features, capabilities, limitations and trends of the aforementioned processes.

Contents:

Classes and seminars deal with the fundamentals and equipment of laser material processing, electrical discharge machining, abrasive water jet cutting and additive manufacturing processes. Other processes may be added as deemed suitable. Material interaction, process and equipment possibilities and limitations. Additionally, safety and health aspects of the processes are covered.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

The course consists of lectures and seminars 46h, preparation for the seminars 34h, demonstrations 10h, practical work as a group project 70h, final exam 3h and preparation for the exam 24h. The project work is flexible and enables realization of student-initiated project ideas.

Target group:

Mechanical engineering students in their Bachelor's studies, 3rd year.

Recommended optional programme components:

Production technology studies in general.

Recommended or required reading:

Course notes (mainly in Finnish), contemporary articles. References: Ion, J.C. Laser Processing of Engineering Material, Elsevier 2005. Steen, W.K. Laser Material Processing, Springer 2003.

Assessment methods and criteria:

Final exam. The final grade is based on the combined points from the exam (0.4), seminar and practical work (0.6).

Grading:

1 to 5, zero denotes failure to pass.

Person responsible:

Jyri Porter

Other information:

The course objective is to familiriaze students especially with methods for manufacturing parts used in mechanical engineering. Methods covered in the course are alternative or supplementary to traditional manufacturing methods.

463105A: Casting techniques, 8 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jouko Heikkala

Opintokohteen kielet: Finnish

Leikkaavuudet:

463065A-01	Manufacturing of plastic products, examination	0.0 op
463065A-02	Manufacturing of plastic products, exercise work	0.0 op
463058A-01	Foundry Technology, examination	0.0 op
463058A-02	Foundry Technology, exercises	0.0 op
463058A-03	Foundry technology, laboratory exercise	0.0 op
463058A	Foundry Technology	3.5 op
463065A	Manufacturing of Plastics Products	3.5 op

ECTS Credits:

8 ECTS

Language of instruction:

Finnish

Timing:

The course is scheduled for the autumn semester, 1st and 2nd period.

Learning outcomes:

The aim of the course is to give the students basic information concerning casting processes in manufacturing and how they are applied to different kinds of production and materials and also what those methods require for product design. After completing the course the student can estimate which kinds of products are possible and profitable to make by casting. The student can name the main principles of common casting methods and how those methods suit to different kinds of products, materials and various sizes. The student knows the most common metallic and plastic materials and the suitable casting methods for those. The student can also explain the main steps of the process plan and casting system design.

Contents:

Different types of patterns and moulds. Molding, casting and melting methods. Cast metals and plastics. Parts post-processing. Design of cast part and process. Main types, properties and use of technical plastics. Injection molding and special applications. Other plastic part manufacturing methods. Design of cast product. Tool and die design and manufacturing. The use of computer-aided design tools and additive manufacturing.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures and exercises, examination.

Target group:

Students of the Bachelor stage of the Mechanical Engineering Degree Programme.

Recommended or required reading:

Lectures; News articles and web pages (given in lectures). Autere, Ingman, Tennilä: Valimotekniikka I ja II; Ihalainen-Aaltonen-Aromäki-Sihvonen: Valmistustekniikka. Valutekniikka, s. 59-88
Valuatlas: https://www.valuatlas.fi/
Virtuaaliyliopisto; Muoviteknologia: http://www.uiah.fi/virtu/materiaalit/muoviteknologia/
Muoviteollisuus ry: http://www.muoviteollisuus.fi/opetusmateriaalit/muovien_ihmeellinen_maailma/ Muovinetti: https://muovinetti.com/hyva-tietaa-muovista/
Suomen valimotekninen yhdistys: http://www.svy.info/

Assessment methods and criteria:

Examination and exercises are graded 1-5. The final grade is determined 30% by the exercises and 70% by the examination.

Grading:

Numerical grading scale 1-5.

Person responsible:

Jouko Heikkala

465104A: Heat treatment and welding of metals, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Timo Kauppi
Opintokohteen kielet: Finnish
Leikkaavuudet:

465077A-01	Welding Technology, examination	0.0 op
465077A-02	Welding Technology, exercises	0.0 op
465077A	Welding Technology	3.5 op

ECTS Credits:

5 cr; study time 135 h

Language of instruction:

Finnish

Timing:

Periods 1-2, autumn term.

Learning outcomes:

After the course, the student is able to select the most suitable heat treatment process and to give the main characteristics of the heat treating parameters for achieving the required properties such as yield/tensile strength, ductility, toughness, surface hardness and/or fatigue strength. He/she is also able to explain the metallurgical phenomena occurring in a sample during heat treatment. In the area of welding technology, 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 weld joint properties, weld defects and their inspection, 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:

Heat treating and welding processes, their applicability.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures (32 h) will take place during period 3, and the three laboratory exercises in small groups will be during periods I – II. The final grade is based on the points from the final exam or small exams.

Prerequisites and co-requisites:

465101A Introduction to Materials for Mechanical Engineering; 465102A Materials for mechanical Engineering.

Recommended or required reading:

Lecture handouts (in Finnish) and other given materials.

Assessment methods and criteria:

Midterm exams or one final exam is required and accepted exercises. The laboratory exercises will be graded as pass/fail.

Grading:

Numerical grading scale 1-5.

Person responsible:

Timo Kauppi

462107A: Maintenance of machines, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jouni Laurila

Opintokohteen kielet: Finnish

Leikkaavuudet:

464087A-01	Maintenancy Technology, examination	0.0 op
464087A-02	Maintenancy Technology, exercise work	0.0 op
464087A	Maintenancy Technology	5.0 op

ECTS Credits:

5 ECTS credits / 135 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the spring semester, during period 4. It is recommended to complete the course at the 3rd spring semester.

Learning outcomes:

After completing the course, the student will be familiar with the principles and most common methods of implementing fitness based maintenance. They are able to explain the importance of running in production and apply the most important standards in the field of maintenance. different types of maintenance and can tell you what aspects of choosing a maintenance strategy. The student knows how to name the most common machine failure methods and the consequences of failure and can tell how to prevent failure in typical situations. The student recognizes the effects of wear and lubrication on the condition of machines and is able to explain the basic concepts related to lubricant analysis. The student knows how to use the most common methods used in machine condition monitoring and how to use them. He / she can explain

the basics of vibration measurements and can choose appropriate measurement and analysis methods to identify the most common machine failures. The student knows the importance of running in production and is able to apply the most important standards in the field of maintenance.

Contents:

Condition based maintenance, failure, wear and lubrication, common condition monitoring methods, basics of performing vibration measurements, analyzing and signal processing, common rotating machine failure detection, vibration intensity estimation, rotor dynamic balancing, machine design and condition, machine design and condition management. failure, wear and lubrication, machine condition monitoring basics and common methods.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 24 h / group work 50 h / self-study 61 h

Target group:

Bachelor's degree students in the mechanical engineering

Prerequisites and co-requisites:

The recommended prequisite is the completion of the following course: 462103A Introduction to Maintenance

Recommended optional programme components:

The course is an independent entity

Recommended or required reading:

Luentomoniste ja muu kurssin aikana jaettava materiaali. Oheiskirjallisuus: Järviö, J. & Lehtiö. T., Kunnossapito: tuotanto-omaisuuden hoitaminen. Helsinki, KP-Media Oy 2012. Antila, K., et al., Teollisuusvoitelu, KP-Media Oy, 2003. Mikkonen, H. (toim.), Kuntoon perustuva kunnossapito, KP-Media Oy, 2009.

Assessment methods and criteria:

Final examination and the other graded assignments

Grading:

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

Person responsible:

Jouni Laurila

A400075: Bachelor's Thesis and Seminar or Communication Studies, 10 op

Voimassaolo: 01.08.2007 -
Opiskelumuoto: Bachelor's Thesis and Seminar or Communication Studies
Laji: Study module
Vastuuyksikkö: Faculty of Technology
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

Compulsory

900060A: Technical Communication, 2 op

Voimassaolo: 01.08.2005 - 31.07.2021
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Languages and Communication
Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

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

Proficiency level:

This course is not offered in English. It is only Finnish-speaking students.

Status:

This course unit is compulsory for students of Electrical Engineering, Computer Science, Communications Technologies and Engineering Mechanical Engineering, Process and Environmental Engineering.

Required proficiency level:

-

ECTS Credits:

2 credits

Language of instruction:

Finnish

Timing:

1st year: Process and Environmental Engineering
2nd year: Communications Technologies
3rd year: Geoscience; Mechanical Engineering; Electrical Engineering, Computer Science and Engineering Technologies

Mode of delivery:

Multimodal teaching

Learning activities and teaching methods:

Contact hours ca. 20 h and independent group work or self-study ca. 34 h.

Target group:

Bachelors students of Electrical Engineering, Computer Science, Communications Technologies and Engineering Mechanical Engineering, Process and Environmental Engineering.

Prerequisites and co-requisites:

-

Recommended optional programme components:

-

Recommended or required reading:

Kauppinen, Anneli & Nummi, Jyrki & Savola, Tea: Tekniikan viestintä: kirjoittamisen ja puhumisen käsikirja (EDITA); Nykänen, Olli: Toimivaa tekstiä: Opas tekniikasta kirjoittaville (TEK) and material in Moodle study environment.

Assessment methods and criteria:

Active participation in contact teaching, independent study and completion of given assignments.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Pass / fail

Person responsible:

Kaija Oikarainen

Working life cooperation:

-

Other information:

All students are required to attend the first meeting of the course unit so the work groups can be formed and work started in a timely and efficient manner. When signing up for the course unit, you should keep in

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

469081A: Bachelor's Thesis / Mechanical Engineering, 8 op

Voimassaolo: 01.08.2007 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

8 ECTS

Language of instruction:

Finnish, can be written in English if needed.

Timing:

The end of Bachelor's studies

Learning outcomes:

Upon completion of the thesis the student can create a research plan, and define a research problem and research questions. She/He is able to manage her/his own work according to the project plan. The student can also utilize different information sources and critically evaluate the information obtained. The student is able to produce clear and finalized text, in line with technical and scientific writing practices.

Contents:

The student chooses the theme for the thesis in cooperation with his/her supervisor.

Mode of delivery:

The thesis is written towards the end of the BSc studies, typically during the third year.

Learning activities and teaching methods:

Independent work.

Target group:

Bachelor Students of Mechanical Engineering.

Prerequisites and co-requisites:

Basic and intermediate studies.

Recommended optional programme components:

Information Skills and Technical communication

Assessment methods and criteria:

BSc thesis and related maturity test.

Grading:

pass/fail

Person responsible:

The supervisor of Thesis

Working life cooperation:

Thesis' theme is often selected from the real research project or it is possible to do with industrial company.

469080A: The Maturity Test for BachelorŽs Degree, 0 op

Voimassaolo: 01.08.2007 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

ECTS Credits:

0 ECTS

Language of instruction:

Finnish or Swedish.

Timing:

After completion of the bachelor's thesis.

Learning outcomes:

The student can produce mature text in popular form of the research field and thus show ones familiarity to the field.

Contents:

Depends on the topic of the thesis.

Mode of delivery:

Literary work.

Learning activities and teaching methods:

Exam

Target group:

Bachelor Students of Mechanical Engineering

Recommended or required reading:

Will be written after the Bachelor's Thesis has been submitted for review.

Assessment methods and criteria:

Student writes an essay in his/her native language about the topic of the Bachelor's thesis to show a good command of the language and the content of the thesis

Grading:

Pass or fail. Both the contents and language are assessed.

Person responsible:

Supervisor of Thesis

A460221: Module of the Option, Automotive Engineering, 39,5 op

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

Ei opintojaksokuvauksia.

e

464122A: Mobile hydraulics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jonne Untinen

Opintokohteen kielet: Finnish

Leikkaavuudet:

460076A Mobile Hydraulics 3.5 op

ECTS Credits:

5 ects cr/ 133 hours of student's work

Language of instruction:

Finnish

Timing:

Lectures and exercises during periods 3.-4.

Learning outcomes:

The objective of the course is to provide the students with a general idea of the design and dimensioning of hydraulic systems used in mobile machines. Upon completion of the course, the student is able to describe the basic circuits and characteristics in mobile hydraulics. The student can also describe the most important components and operational preconditions of the mobile hydraulic system The student is able design simple mobile hydraulic systems. Furthermore, the student is able have discussions with the experts in the field of mobile hydraulics using relevant terminology. The student is also capable of dimensioning the simple hydraulic drivetrain systems.

Contents:

Applications of hydraulic systems in mobile machines; Fundamentals of proportional- and hydraulic technique;. Components and their properties; Basics of design and dimensioning; Maintenance and safety of hydraulic systems. Basics of the digital valves and valve control systems.

Mode of delivery:

Distance-teaching.

Learning activities and teaching methods:

The course consists of distance-teaching 20 h, distance-guided exercises 20 h, exercise work and homework. 95 hours of independent studying.

Target group:

Mechannical Engineering Master's students.

Prerequisites and co-requisites:

462104A Machine automation, 462109S Machine modelling and simulation

Recommended or required reading:

Fonselius, J: Koneautomaatio: Hydrauliikka. 1995. Fonselius, J: Koneautomaatio: Servotekniikka. 1998. Mäkinen, R: Hydrauliikka II. 3rd ed. 1991. Louhos, P&J-P: Ajoneuvo- ja työkonehydrauliikat. 1992. Current publications in the field of mobile machines and hydraulics.

Assessment methods and criteria:

Final exam, The grade is determined by the sum of examination and exercises

Grading:

Numerical grading scale 1-5.

Person responsible:

Jonne Untinen

464121A: Automotive engineering principles, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

462050A-01 Automotive Engineering, examination 0.0 op

462050A-02 Automotive Engineering, laboratory exercises 0.0 op

462050A Automotive Engineering 5.0 op

ECTS Credits:

5 ECTS / 133 student work hours

Language of instruction:

Finnish

Timing:

Lectures and exercises during the periods 1. -2.

Learning outcomes:

The goal of the course is to provide the student with basic concept of vehicle mechanics and mobility, motor vehicle regulations and technical inspections, structural systems of automotives, vehicle design principles, environmental effects of vehicles and exhaust gas emission treatment methods.The student is capable of identifying requirements of type approval and periodic technical inspections. The student will know the functions of steering, brake and electronic systems, axles and wheels support mechanisms. The student is capable of determining tiresfor vehicles and the force mechanism of pneumatic tire on road surface. He/she will know the provisions concerning exhaust gas emission limit values and measuring methods for motor vehicle and construction machines. The student is able to determine mobility maps and fuel consumption for on- and off road vehicles accordingly and is capable of determining the capacity of engine and transmission systems as well as steering geometry and performing technical measurements in automotive laboratories and road conditions.

Contents:

Road legislation for vehicles; Type approval; Periodic technical inspections; Structural systems of automotives; Driving resistances and mobility maps for on-road and off-road vehicles; Tire categories and standards; Force mechanism of pneumatic tire on road surface; Steering geometry of automotives; Engine and transmission systems; Automotive electrical systems; Fuel consumption; EU, EPA and apan exhaust gas emission legislation, Steering and drivetrain systems of the tracked Vehicles.

Mode of delivery:

Distance-teaching

Learning activities and teaching methods:

Distance-lectures (30 hours) and distance-guided calculation exercises (20 hours). Automotive laboratory exercises will be performed in the OAMK automotive laboratory. Grades will be based on an exam, practical exercises and laboratory experiments. 83 hours of student's independent work.

Target group:

Students of the Master's stage of the Mechanical Engineering Degree Program.

Recommended or required reading:

Lecture notes and the material will be handed out during the lectures. International vehicle regulations and directives. Liikenteen turvallisuusviraston (Trafi) määräyskokoelmat. Automotive Handbook. 8.painos 2011. Gummerus Oy. Juhala, M; Moottorialan sähköoppi. 2005. Autoalan Koulutuskeskus. Rengasnormit .2006 Scandinavian Tire and RimOrganization. STRO.
Additional literature:
J., Y.Wong, Theory of Ground Vehicles 4th edition. John Wiley&Sons, Inc., 2008; Braess, H-H., Seiffert, U., Handbook of Automotive
Engineering.2005. SAE. Gillespie, T.D. Fundamentals of Vehicle Dynamics. 1992. SAEMitschke, M. Dynamik der Kraftfahrzeuge, Band A: Antrieb und Bremsung. 1995. Springer Verlag, Berlin.

Assessment methods and criteria:

Final exam, the final grade is based on the combined points from the exam (weight factor 0.5) and exercises (weight factor 0.5).

Grading:

Numerical grading scale 1-5.

Person responsible:

Perttu Niskanen

464123S: Structural systems in automotive vehicles, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Perttu Niskanen

Opintokohteen kielet: Finnish

Leikkaavuudet:

460071A-01	Structural Systems in Automotive Vehicles I, examination	0.0 op
460071A-02	Structural Systems in Automotive Vehicles I, exercises	0.0 op
460071A	Structural Systems in Automotive Vehicles I	5.0 op

ECTS Credits:

5 ects cr/ 133 hours of student's work

Language of instruction:

Finnish

Timing:

Lectures and exercises during periods 3.-4. Practical work and laboratory, periods 3.-4.

Learning outcomes:

The aim of this course is for the student to become familiar with the basic principles of designing automotive vehicles and construction machines, product development and maintenance.The student is able to design an automotive vehicle chassis, support mechanisms for axles and wheels, and a fastening mechanism for load structures. The student is capable of accounting for basic principles in railway vehicle design. In addition to this, the student is able to measure brake and transmission systems for automotive vehicles, determine load models and dynamic stability of automotive vehicles and construction machines. The student is capable of explaining the regulations and standards that need to be taken into account in automotive vehicles and construction machines design and dimensioning. The student is capable of planning maintenance for a life-cycle of a vehicle and performing technical measurements in automotive laboratories and road conditions.

Contents:

Chassis construction and dimensioning of automotive vehicles; Support and fastening mechanism of axles and load structures; Stability of tilting load structure, crane equipment and machinery; Rollover stability of container vehicles and busses; Support solutions for automotive tires; Power transmission systems for automotive vehicles; Steering systems of automotive vehicles; Automotive brake legislation; The basics of automotive braking; Braking systems of light- and heavy-duty vehicles and trailers combinations; Automotive electrical systems Automotive technical measurements in automotive aboratories and road conditions

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures (40 hours) and calculation exercises(26 hours). Automotive laboratory exercises will be performed in the OAMK automotive laboratory. Grades will be determined by an exam, exercises and laboratory experiments. 67 hours of student's independent work

Prerequisites and co-requisites:

464121A Automotive Engineering Principles

Recommended or required reading:

Lecture notes and the material will be handed out during the lectures. International vehicle and machinery regulations and directives will be used.

Additional literature:
Happian-Smith, J., An Introduction to Modern VehicleDesign. Butterworth-Heinemann. 2001; Reimpell, J., Stoll, H., Betzler, J.
W., Automotive Chassis: Engineering Principles. Butterworth-Heinemann. 1995; Anselm, D., The Passenger Car Body. Vogel Fachbuch, 2000;
Braess ,H-H., Seiffert, U., Handbook of Automotive Engineering.SAE, 2005; Beerman, H,J., Rechnerische Analyse von Nutzfahrzeugtragwerken. Verlag TÜV Rheinland,1986; Lechner, G., Naunheimer, H., Automotive Transmissions. Springer-Verlag, 1999; Reimpell, J., Fahrwerktechnik: Radaufhängungen. Vogel-Verlag, Würzburg, 1988. Bosch, Automotive Brake Systems. 1995. Bosch GmbH; Limbert, R., Brake Design and Safety. Second Edition. SAE 1999; Breuer, B., Dausend, U., Advanced Brake Technology. SAE; Breuer., B., Bremsenhandbuch. 2004. SAE; Burckhardt, M., Fahrwerktechnik: Bremsdynamik und Pkw-Bremsanlagen. 1.Auflage. Vogel –Verlag, 1991; Klug H-P., Nutzfahrzeug-Bremsanlagen. Vogel Buchverlag Wurzburg, 1990, 2001; Mitschke, M. Dynamik der Kraftfahrzeuge, Band A: Antrieb und Bremsung, Springer Verlag, Berlin, 1995; Chen, F., Chin, A.,T, Quagliga, R., Disc Brake Squeal. Mechanism, Analysis, Evaluation and Reduction/Prevetion, 2005. SAE; Wong, J., Y., Theory of Ground Vehicles. John Wiley&Sons, Inc., 2001. Automotive electrics and electronics. 3rd Edition,1999;

Assessment methods and criteria:

The final grade is based on the combined points from the exam (grade 0.5) and exercises (grade 0.5)

Grading:

Numerical grading scale 1-5.

Person responsible:

Perttu Niskanen

464125S: Automotive development project, 10 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Perttu Niskanen

Opintokohteen kielet: Finnish

Leikkaavuudet:

460072S-01	Structural Systems in Automotive Vehicles II, examination	0.0 op
460072S-02	Structural Systems in Automotive Vehicles II, exercises	0.0 op
460072S	Structural Systems in Automotive Vehicles II	8.5 op

ECTS Credits:

10 ects cr/ 266 hours of student's work

Language of instruction:

Finnish

Timing:

Lectures and exercises during periods 1.2. Practical work and laboratory, periods 1.-2.

Learning outcomes:

The aim of this course it to familiarize the student with the product development of automotive vehicles and construction machines, dimension principles of vehicles and structural systems, driving stability of automotive vehicles, and railway vehicle technology. The student will learn how to perform measurements in automotive laboratories and based on road conditions.The student is capable of applying the methods of life cycle design and product development of automotive vehicles and construction machines. The student is able to determine the structure loads of machinery and endurance and is capable of designing steering and power transmission systems of automotive vehicles. The student is capable of dimensioning suspension and damping equipment for automotive vehicles and is capable of determining models of vehicle dynamics on road condition cases. Finally, the student is capable of determining driving stability.

Contents:

Suspension systems and basis of automotive vehicles and construction machines; Steering and power transmission systems of automotive vehicles; Modeling of vehicle dynamics of automotives and vehicle combinations; Automotive technical measurements in automotive laboratories; An industry design exercise assignment

Mode of delivery:

Face-to-face teaching:

Learning activities and teaching methods:

Lectures (30 hours) and calculation exercises(18 hours) Automotive laboratory exercises will be performed in the OAMK automotive laboratory. 218 hours of Student's independent work. A designing assignment for automotive industry will be included in the course. Grades will be determined by an exam, exercises, designing assignment and laboratory experiments.

Prerequisites and co-requisites:

464121AAutomotive Engineering
464123S Structural Systems in Automotive Vehicles
464122AMobile Hydraulics
462109S Simulation and modelling of machines

Recommended or required reading:

Lecture notes and the material will be handed out during the lectures.
Additional literature:
Gillespie, T.D.: Fundamentals of Vehicle Dynamics. 1992. SAE. Mitschke, M.: Dynamik der Kraftfahrzeuge, Band B: Schwingungen, Springer Verlag, Berlin, 1997. Wheels and Axles.Cost- effective Engineering.2000; Stability Systems. Robert Bosch GmbH ; Dixon, J.,C., Tires, Suspension and Handling. Second Edition. 1996. SAE. Genta,G., Motor Vehicle Dynamics.Modeling and Simulation. 1999.World Scientific.

Assessment methods and criteria:

The final grade is based on the combined points from the exam (weight factor 0.5) and exercises (weight factor 0.5).

Grading:

Numerical grading scale 1-5.

Person responsible:

Perttu Niskanen

464124A: Internal combustion engines, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Miro-Tommi Tuutijärvi

Opintokohteen kielet: Finnish

Leikkaavuudet:

460073A-01	Internal Combustion Engines I, examination	0.0 op
460073A-02	Internal Combustion Engines I, exercises	0.0 op
460073A	Internal Combustion Engines I	3.5 op

ECTS Credits:

5 ects cr/ 133 hours of student's work

Language of instruction:

Finnish

Timing:

Lectures and exercises during periods 3.-4. Practical work and laboratory, periods 3.-4.

Learning outcomes:

The aim of the course is to provide students with general conception of vehicle and machinery engines, operating principles, main dimensioning methods, thermodynamic work cycles, environmental issues and maintenance. The other main aim of this course is to familiarize the student with experimental research methods in engine laboratory, measuring and data acquisition methods, measuring technology, systematic planning and implementation of measurements, discussion of experimental results, reporting and quality systems of laboratory measurements as well as product development activities. The student is capable of accounting for working principles of a piston engine. The student is able to explain mixture formation, factors affecting cylinder filling and burning processes, exhaust gas emission formation and methods of maintenance. The student is able to perform basic dimensioning of charged and naturally aspirated piston engines and thermodynamic calculations as well as draw up characteristic drawings. The student is capable of using international standards related to measurements of internal combustion engines and quality systems with expertise. The student is able to account for operating principles and requirements of engine load device, measuring device and data acquisition system. The student is able to draw up measuring plans, perform measurements, write measuring reports and perform a critical analysis of the results.

Contents:

Structural systems and basics of piston engines; Mixture formation and cylinder filling; Engine fuels; Exhaust gas emission formation; Ignition, fuel and control systems; Main dimensioning methods for piston engines; Theoretical work cycles and efficiencies; Charging methods; Technical measurements for engines Measuring and data acquisition systems of engine laboratory; Measurements of experimental room conditions; Engine braking units; Engine load cycles; Power; torque and speed of rotation; Measuring air quantity; Measuring fuel mass; Determining the air coefficient; Lambda sensor; Exhaust gas emission analyzers; Combustion pressure sensor of a cylinder; Experiments: determining engine load cycles; Characteristic fuel consumption with various loadings; Determining exhaust gas emissions with various tests cycles.; Testing exhaust gas catalytic converter; Reporting experimental measurements

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures (26 hours) and calculation exercises(20 hours). The course consists of lectures and calculation exercises. There will also be exercises and laboratory experiments in the course. Engine technical measurements will be performed at the OAMK automotive vehicle and engine laboratory. Grades will be determined by an exam, exercises and laboratory experiments. 87 hours of student's independent work

Recommended or required reading:

Lecture notes and the material will be handed out during the lectures. Aumala; Mittaustekniikan perusteet. 359, Otatieto..1989. Bosch Automotive Handbook 8th edition, Robert bosch Gmbh 2011
Additional literature:
Heywood, John B.,Internal Combustion Engine Fundamentals. McGraw-Hill Book Company. 1988. Stone, R., Introduction to Internal Combustion Engines. 3rd Edition. 1999. SAE. Pulkrabek, W., Engineering Fundamentals of the Internal Combustion Engine. 2nd Edition. 2004. Baines,N.C., Fundamentals of Turbocharging. 2005. Concepts NREC.USA.. van Basshuysen, R.,Schäfer,F., Internal Combustion Engine Handbook. SAE.2004. Heisler, H., Advanced Engine Technology. 2003. Butterworth-Heinemann. Merker, G.P., Stiesch,G., Technische Verbrennung. Motorische Verbrennung. 1999. B.G.Teubner Dietzel,F., Wagner, W., Technische Wärmelehre. 7. Auflage.1998. Vogel- Buchverlag. Zhao,H., Ladommatos,N., Engine Combustion Instrumentation and Diagnostics.2001. SAE. Standardit EC 80/1269, ISO 1585, ISO 8178. JIS D 1001 , SAE J 1349 , DIN 70020. Plint,M., Martyr A., Engine Testing. Theory and Practice. 2nd Edition. Butterworth- Heinemann Blair. G.,P., Design and Simulation of Four- Stroke Engines. 1999. SAE

Assessment methods and criteria:

The final grade is based on the combined points from the exam (grade 0.4) and exercises (grade 0.6).

Grading:

Numerical grading scale 1-5.

Person responsible:

Miro-Tommi Tuutijärvi

464126S: Machine dynamics of piston engines, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Miro-Tommi Tuutijärvi

Opintokohteen kielet: Finnish

Leikkaavuudet:

460074S-01 Internal combustion engines II, examination 0.0 op

460074S-02 Internal combustion engines II, exercises 0.0 op

460074S Internal Combustion Engines II 5.0 op

ECTS Credits:

5 ects cr/ 133 hours of student's work

Language of instruction:

Finnish

Timing:

Lectures and exercises during periods 1.-2. Practical work and laboratory, periods 1.-2.

Learning outcomes:

The student will become familiar with mechanical dynamics and vibrations of piston engines and basis for dimensioning of mechanical elements of crankshaft mechanism.The student is capable of determining kinematics and characteristic drawings. The student will be familiar with mass, gas, tangential and bearing force diagrams. Student is able to determine balancing method of mass forces and vibration damping method of the crankshaft mechanism. In addition to this, the student is able to determine dimensions of machine elements and analyze them using methods applicable for engine design

Contents:

The kinematics and kinetics of crankshaft mechanism; Gas, mass and bearing forces; Tangential force and torque; Mass forces balancing methods; Vibration mechanics of crank shaft mechanism; Dimensioning methods for machine elements of crank shaft mechanism; Analysis methods of piston engines

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures (40 hours) and calculation exercises(20 hours). The grades will be determined by an exam, exercises and laboratory experiments. 73 hours of student's independent work.

Prerequisites and co-requisites:

464124A Internal Combustion Engine

Recommended or required reading:

Lecture notes and the material will be handed out during the lectures. Additional literature: Heywood, John B.,Internal Combustion Engine Fundamentals. McGraw-Hill Book Company. 1988. Stone, R., Introduction to Internal Combustion Engines. . 3rd Edition 1999. Pulkrabek, W., Engineering Fundamentals of the Internal Combustion Engine. 2nd Edition. 2004. Baines,N.C., Fundamentals of Turbocharging. 2005. Concepts NREC. van Basshuysen, R.,Schäfer,F., Internal Combustion Engine Handbook. SAE.2004. Heisler, H., Advanced Engine Technology. 2003. Butterworth-Heinemann. Merker, G.P., Kessen,U., Technische Verbrennung Verbrennungsmotoren. 1999.Teubner , Hoag,K., L., Vehicular Engine Design. SAE.2006. . Blair. G.,P., Design and Simulation of Four-Stroke Engines. 1999. SAE.

Assessment methods and criteria:

The final grade is based on the combined points from the exam (grade 0.5) and exercises (grade 0.5).

Grading:

Numerical grading scale 1-5.

Person responsible:

Miro-Tommi Tuutijärvi

461112S: Mechanical vibrations, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Laukkanen, Jari Jussi

Opintokohteen kielet: Finnish

Leikkaavuudet:

461019S-01 Mechanical Vibrations, examination 0.0 op

461019S-02 Mechanical Vibrations, exercises 0.0 op

461019S Mechanical Vibrations 6.0 op

ECTS Credits:

5 ects /135 hous of work

Language of instruction:

Finnish

Timing:

Lectures and exercises during the periods 3 - 4.

Learning outcomes:

The aim of this course is to familiarize students with the principles and phenomena of mechanical vibrations and show how different vibrations can be represented by a theoretical model and how detrimental vibrations can be avoided in structures and machines.
Learning outcomes: After the course, the student is capable of forming the equations of motion for a single and multi-degree-of-freedom systems and continuous models and is able to solve them using analytical, numerical and approximate methods. Moreover, the student is able to use finite element methods to solve basic vibration problems.

Contents:

Basic principles; Vibrations of single degree-of-freedom systems; Vibrations of multi-degree-of-freedom systems; Torsional vibration of a power drive chain; Longitudinal, transverse and torsional vibrations of a beam represented by a continuous model; Some approximation methods; Use of FEM in vibration analysis; Introduction to the theory of balancing; Experimental modal analysis.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

This course will be based on lectures 45 h and exercises 30 h and 45 h self-study during periods 3 – 4 and 15 h for a project work. Students are required to take a final exam or mid-term exams.

Prerequisites and co-requisites:

First year mathematics, Strength of Materials I & II and Dynamics.

Recommended or required reading:

Pramila, A.: Värähtelymekaniikka, Chap. 10: Koneenosien suunnittelu 4, WSOY, 1985. James, M.L. & al.: Vibration of Mechanical and Structural Systems: With Microcomputer Applications, Harper & Row, 1989.

Assessment methods and criteria:

The grade of the course is based on midterm exams or a final examination. The student must pass the exercises before taking the examination.

Grading:

Numerical grading scale 1-5.

Person responsible:

Jari Laukkanen

460004S: Practical Training II, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Practical training

Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Reijo Saari
Opintokohteen kielet: Finnish
Leikkaavuudet:

485002S	Advanced Practical Training	5.0 op
460002S	Practical Training II	3.0 op

Ei opintojaksokuvauksia.

A460222: Module of the Option, Machine Design, 40 op

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

Ei opintojaksokuvauksia.

en

464106S: Production machine design, Paper machinery, 10 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

464074S-01	Paper Machinery Construction, examination	0.0 op
464074S-02	Paper machinery construction, seminar	0.0 op
464074S	Paper Machinery Construction	7.0 op

ECTS Credits:

10 ects / 267 hours of studying work

Language of instruction:

Finnish, can be completed in English as a book examination

Timing:

Lectures and seminars arranged during autumn and spring periods 1.- 3.

Learning outcomes:

Upon completion of this course the students can describe the most common problems of the production machines and know the effects of machine constructions to quality and production. During the course papermachine is used as an example of production machines. After the course students can explain the importance of the pulp and paper industry to domestic economy and can describe the main stages of paper making processes.

Contents:

Fundamentals of production machine structures and their design criteria. Detailed design criteria of paper machine parts, calenders, rolls as well as construction materials.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 100 h / seminars 12 h / company excursions 30 h / individual studies 60 h.

Target group:

Master's degree students of mechanical engineering or process engineering

Recommended or required reading:

Copies of lecture material

Assessment methods and criteria:

Two midterm exams or one final exam is required and accepted seminar.

Grading:

Numerical grading scale 1-5 / fail

Person responsible:

professor Juhani Niskanen

464107S: Machine design project, 10 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Niskanen, Juhani

Opintokohteen kielet: Finnish

Leikkaavuudet:

464058S	Project Work in Machine Design	8.5 op
464084S	Project Work in Paper Machinery Construction	8.5 op

ECTS Credits:

10 ects / 267 hours of studying work.

Language of instruction:

Finnish, can be completed in English as a book examination

Timing:

Work can be started during the lectures of the course Production Machine Design

Learning outcomes:

The aim of this course is to deepen the student's knowledge of constructions of production machines with the help of extensive exercise. Upon completion of the course, the student has realized a demanding research, development or design project from a topic given by the industry. After completion of the course, the student is able to analyze, develop or improve existing machine components or processes.

Contents:

Carrying out a wide industry based product development, research or design project.

Mode of delivery:

Individual project work.

Learning activities and teaching methods:

Project work is done in groups of 1 to 4 students depending on the size and requirements of the work.

Target group:

Master's degree students of mechanical engineering or process engineering

Prerequisites and co-requisites:

Machine Design or/and Production Machine Design

Recommended optional programme components:

Production Machine Design

Recommended or required reading:

Supplied according to needs

Assessment methods and criteria:

Accepted project work

Grading:

Numerical grading scale 1-5 / fail

Person responsible:

professor Juhani Niskanen

464105S: Computer aided design, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

462044S-01	Computer Aided Design, examination	0.0 op
462044S-02	Computer Aided Design, exercise work	0.0 op
462044S	Computer Aided Design	3.5 op

ECTS Credits:

5 ects / 133 hours of studying work.

Language of instruction:

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

Timing:

Lectures and exercises arranged spring during periods 3. Recommended date of performance 4th year spring.

Learning outcomes:

After completing the course, the student will know modern CAD/CAE tools, simulation and virtual validation possibilities with CAD/CAE systems. The best procedures in various design tasks have also become familiar. In addition, the student is familiar with the theory behind CAD systems related to the geometry of models and their modification. In addition, the student also has a basis for product information management and the use of design data in PDM/PLM systems.

Contents:

The course includes product design and product validation on a computer-aided basis. During the course, you will get acquainted with the possibilities of product design and validation of functionality using CAD /CAE systems. Use of the computer in design functions and the applicable systems. Parametricity and customizability of the product play an important role. In addition,students learn what special tools design software offers.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 20 h/ exercises 30 h/ practical assignment 83 h. Exercises are carried out independently and the assignment in small groups.

Target group:

Master's Degree student of mechanical engineering, specially students studying Machine Design.

Prerequisites and co-requisites:

Machine Drawing and CAD, Design of Machine Elements.

Recommended optional programme components:

The course is an independent entity and does not require other studies to be completed at the same time.

Recommended or required reading:

e-Design Computer-Aided Engineering Design (Chang K-H., Elsevier, 2015)
In addition: Lee, K. Principles of CAD/CAM/CAE Systems, Addison-Wesley, Inc.: New York, 1999, 581 s.

Assessment methods and criteria:

Final exam, lecture exercises and exercise work. For the final grade, the exam has a weight factor of 0.4; for lecture exercises, 0.2; and for exercise work, 0.4.

Grading:

Numerical grading scale 1-5 / fail

Person responsible:

Jussi Salakka

461112S: Mechanical vibrations, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Laukkanen, Jari Jussi
Opintokohteen kielet: Finnish
Leikkaavuudet:

461019S-01	Mechanical Vibrations, examination	0.0 op
461019S-02	Mechanical Vibrations, exercises	0.0 op
461019S	Mechanical Vibrations	6.0 op

ECTS Credits:

5 ects /135 hous of work

Language of instruction:

Finnish

Timing:

Lectures and exercises during the periods 3 - 4.

Learning outcomes:

The aim of this course is to familiarize students with the principles and phenomena of mechanical vibrations and show how different vibrations can be represented by a theoretical model and how detrimental vibrations can be avoided in structures and machines.
Learning outcomes: After the course, the student is capable of forming the equations of motion for a single and multi-degree-of-freedom systems and continuous models and is able to solve them using analytical, numerical and approximate methods. Moreover, the student is able to use finite element methods to solve basic vibration problems.

Contents:

Basic principles; Vibrations of single degree-of-freedom systems; Vibrations of multi-degree-of-freedom systems; Torsional vibration of a power drive chain; Longitudinal, transverse and torsional vibrations of a beam represented by a continuous model; Some approximation methods; Use of FEM in vibration analysis; Introduction to the theory of balancing; Experimental modal analysis.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

This course will be based on lectures 45 h and exercises 30 h and 45 h self-study during periods 3 – 4 and 15 h for a project work. Students are required to take a final exam or mid-term exams.

Prerequisites and co-requisites:

First year mathematics, Strength of Materials I & II and Dynamics.

Recommended or required reading:

Pramila, A.: Värähtelymekaniikka, Chap. 10: Koneenosien suunnittelu 4, WSOY, 1985. James, M.L. & al.: Vibration of Mechanical and Structural Systems: With Microcomputer Applications, Harper & Row, 1989.

Assessment methods and criteria:

The grade of the course is based on midterm exams or a final examination. The student must pass the exercises before taking the examination.

Grading:

Numerical grading scale 1-5.

Person responsible:

Jari Laukkanen

461110S: Fluid mechanics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Koivurova Hannu

Opintokohteen kielet: Finnish

Leikkaavuudet:

461036S-01	Heat and Mass Transfer II, examination	0.0 op
461036S-02	Heat and Mass Transfer II, exercises	0.0 op
461036S	Heat and Mass Transfer II	3.5 op

ECTS Credits:

5 ECTS credits / 105 hours of work

Language of instruction:

Finnish

Timing:

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

Learning outcomes:

The aim of the course is to get acquainted with the basic concepts of flow technology, terminology, techniques for solving the main flow phenomena and flow problems and their application. After completing the course, the student will be able to use the terminology of flow mechanics and will be able to explain what the basic concepts of flow mechanics mean, what principles are the basic equations of flow mechanics and how the equations can be simplified. The student can explain the basic idea of dimensional analysis and apply it in flow mechanics, for example, to scale test results. The student will be able to solve simple flow problems, such as determining the volume flow, pressure drop or pump lift height of the piping and determining the forces and moments affecting the parts based on the flow velocities.

Contents:

Special features of fluids, statics of fluids, application of the ideal flow or Bernoulli equation, global equations of flow, ie flow rate equations, local flow equations and viscous flow, tube flow and its special features and dimensional analysis.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 30 h / Exercise 30 h / Self-study 45 h.

Prerequisites and co-requisites:

Recommended: Thermodynamics, dynamics and statics.

Recommended optional programme components:

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

Recommended or required reading:

Nakayama, Boucher, Introduction to Fluid Mechanics, Bathsworth-Heideman, 2000; Gerhart, Gerhart, Hochstein, Munson's fluid mechanics, John Wiley & Sons, Inc 2017; Munson, Rothmayer, Okiishi, Huebsch: Fluid mechanics, Wiley 2013. 7th ed.

Assessment methods and criteria:

The course is taken in the final exam. In addition, students complete homework throughout the course, which is assessed. One-third of homework assignments must be counted as approved. You can take the exam only after you have successfully completed your homework. The assessment of the course is based on the learning outcomes of the course. More detailed assessment criteria can be found in Moodle's course pages.

Grading:

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

Person responsible:

University Lecturer Hannu Koivurova

462105A: Machine Sensor Technology, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Liedes, Toni Mikael

Opintokohteen kielet: Finnish

Leikkaavuudet:

462053A Sensor Technology of Machine Automation 5.0 op

ECTS Credits:

5 cr / 133 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the autumn semester, during periods 1 and 2. It is recommended to complete the course at the 3rd autumn semester.

Learning outcomes:

Upon completion of the course, the student will be able identify, classify and bring into use the most common sensor types used in machine automation. The student is able to choose sensors for typical automation applications. In addition to this, the student is able to design a common analog and digital signal transmission and conditioning chain.

Contents:

Basics measuring systems; Classification of sensors; Characteristics of analog and digital domain; Analog to digital conversion; Basics of analog signal conditioning: amplification, attenuation and filtering; Operating principle of digital sensors; Examples of typical sensors used in mechanical engineering and civil engineering;

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

Lectures 32 h / Group work 16 h / Self-study 85 h

Target group:

Bachelor's degree students of mechanical engineering

Prerequisites and co-requisites:

The recommended prerequisite is the completion of the following courses prior to enrolling for the course: Actuators in Machine Automation

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:

de Silva, Clarence W. Mechatronics: An Integrated Approach. CRC Press, 2005, 1312 p. Chapters 4-7; Lecture notes.

Assessment methods and criteria:

This course utilizes continuous assessment. The assessment can be based on learning diary, exercises, seminars and exam.

Grading:

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

Person responsible:

Lecturer Toni Liedes

460004S: Practical Training II, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Practical training
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Reijo Saari
Opintokohteen kielet: Finnish
Leikkaavuudet:

485002S	Advanced Practical Training	5.0 op
460002S	Practical Training II	3.0 op

Ei opintojaksokuvauksia.

A460223: Module of the Option, Materials Engineering, 40 op

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

Ei opintojaksokuvauksia.

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465109S: Microstructural changes in metallic alloys, 7 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Nousiainen, Olli Pekka
Opintokohteen kielet: Finnish

Leikkaavuudet:

465063S-01 Microstructural changes in metallic alloys, examination 0.0 op
465063S-02 Microstructural changes in metallic alloys, exercises 0.0 op
465063S Microstructural changes in metallic alloys 7.0 op
465082S-01 Physical Metallurgy II, examination 0.0 op
465082S-02 Physical Metallurgy II 0.0 op
465082S Physical Metallurgy II 7.0 op

ECTS Credits:

7 /189 h study time

Language of instruction:

Finnish

Timing:

Autumn semester period 2. Recommended for fourth year of studies.

Learning outcomes:

After completion of the course, the student will be able to apply basic thermodynamic and kinetic concepts to phase transformations. (S)he will be able to evaluate the effect of phase diagrams on the structure of metallic alloys. The student will be able to explain solidification and precipitation reactions in metallic alloys, and explain the phase transformations occurring during the decomposition of austenite during cooling.

Contents:

Thermodynamics of phase transformations in the condensed state. Phase diagrams. Diffusion and kinetics. Grain and phase boundaries. Solidification and microsegregation. Eutectic and peritectic solidification. Precipitation. Ferrite, pearlite, bainite, martensite.

Mode of delivery:

Face to face

Learning activities and teaching methods:

Lectures and calculation exercises 48 h / independent study 141 h.

Target group:

Compulsory in the masters stage for all Mechanical Engineering students majoring in Materials Engineering.

Prerequisites and co-requisites:

Before registering for this course the student must have successfully completed the following courses: 465101A An Introduction to Materials for Mechanical Engineering, 465102A Materials for Mechanical Engineering, 465107A An Introduction to Physical Metallurgy.

Recommended or required reading:

Porter, D., Easterling, K. & Sherif, M.: Phase Transformations in Metals and Alloys, CRC Press, Boca Raton, 2009. Calculation exercises and other material supplied during the course.

Assessment methods and criteria:

Final grade assessed on the basis of either continuous assessment or final examinations.

Grading:

Pass grades on a scale of 1-5. Grade 0 fail.

Person responsible:

Professor Jukka Kömi

465110S: Strength of metallic alloys, 7 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Nousiainen, Olli Pekka

Opintokohteen kielet: Finnish

Leikkaavuudet:

465064S	Strength of metal alloys	7.0 op
465081S	Physical Metallurgy I	7.0 op

ECTS Credits:

7 ECTS /189 h study time

Language of instruction:

Finnish. A visiting lecturer will give a few lectures in English.

Timing:

Spring semester period 3. Recommended for fourth year of studies.

Learning outcomes:

After completion of the course, the student will know the most important phenomena occurring in metals under stress, understand the relationship between them and microstructure, and understand their effect on strength. (S)he will be able to rationalize the effects of stacking fault energy on dislocation character and motion. (S)he will be able to compare and justify the differences in strain hardening seen in different alloys. The student will be able to explain the effects of grain size on static, fatigue and creep strength. (S)he will be able to explain how to determine fatigue and creep properties and list the most important factors affecting these properties. (S)he will be able to interpret Ashby's deformation maps. The student will be able to explain the most important concepts related to texture.

Contents:

Revision of crystallographic and stereographic concepts. Dislocation types and properties. Strengthening mechanisms: cold work, solid solution strengthening, grain refinement, precipitation. Stacking fault energy and its effect on dislocation structure and strengthening. Microstructural changes in fatigue and creep. Fatigue and creep strengthening mechanisms. The effect of texture on properties.

Mode of delivery:

Face to face

Learning activities and teaching methods:

Lectures and calculation exercises 48 h / independent study 141 h.

Target group:

Compulsory in the masters stage for all Mechanical Engineering students majoring in Materials Engineering.

Prerequisites and co-requisites:

Before registering for this course the student must have successfully completed the following courses: 465101A An Introduction to Materials for Mechanical Engineering, 465102A Materials for Mechanical Engineering, 465107A An Introduction to Physical Metallurgy, and 465109S Microstructural changes in metallic alloys.

Recommended or required reading:

Study guide and lecture presentations. Other material: R.W. Cahn and P. Haasen, Physical Metallurgy, 4 ed., North Holland, 2005 (digital version). R.E. Smallman and R.J. Bishop, Modern Physical Metallurgy & Materials Engineering, 6th ed., Butterworth-Heinemann, Elsevier Science Ltd, 1999 (digital version 2002).

Assessment methods and criteria:

Final grade assessed on the basis of either continuous assessment or final examinations.

Grading:

Pass grades on a scale of 1-5. Grade 0 fail.

Person responsible:

Professor Jukka Kömi

465111S: Welding metallurgy, 8 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Timo Kauppi

Opintokohteen kielet: Finnish

Leikkaavuudet:

465080S-03	Welding Technology, seminar	0.0 op
465080S-01	Welding Metallurgy, examination	0.0 op
465080S-02	Welding Technology, exercise work	0.0 op
465080S	Welding Metallurgy	8.5 op

ECTS Credits:

8 cr / study time 216 h

Language of instruction:

Finnish

Timing:

Lectures (48 h) during the period 3, laboratory exercise continues during the period 4.

Learning outcomes:

The course gives essential background information on the phenomena taking place in welding and their influence on microstructures and mechanical properties and also provides skills in select materials and welding methods. Learning outcomes: Upon completing of the required coursework, student is able to:
-explain the influence of welding conditions on temperature distribution and solidification morphology of a welded joint,
-classify typical microstructures present in the heat-affected zone of low carbon steel weldments,
-compare the importance of microstructure on mechanical properties of the joint, and
-explain the microstructure changes occurring in welding of alloyed steels, cast irons and non-ferrous metals and their influence on properties.
After the course the student also has skills to select a proper weldability test for estimating the risk of cold and hot cracking.

Contents:

Heat distribution in welded joints; Solidification and segregation; Microstructures of the heat-affected zone; Weldability: structural steels, low-alloyed steels, stainless steels, cast irons, nonferrous metals; Welding defects and weldability testing.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

This course consists of 48 hours of lectures during the 3rd period, a seminar and a laboratory exercise with reporting.

Prerequisites and co-requisites:

465104A Heat treatment and welding of metals

Recommended or required reading:

Lecture notes (mainly in Finnish). Kou, S.: Welding Metallurgy, Wiley Co, New York 1987. Easterling K.: Introduction to the Physical Metallurgy of Welding, Butterworths & Co Ltd, London, 1983 Kyröläinen A ja Lukkari J., Ruostumattomat teräkset ja näiden hitsaus, MET, 1999

Assessment methods and criteria:

The final exam or midterm exams and the final grade is based on the exam (weight 0,8) and an exercise report (weight 0,2).

Grading:

Numerical grading scale 1-5.

Person responsible:

Timo Kauppi

465113S: Failure mechanisms in metals, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Nousiainen, Olli Pekka

Opintokohteen kielet: Finnish

Leikkaavuudet:

465079S Failure Analysis 3.5 op

ECTS Credits:

5 ECTS/135 h study time

Language of instruction:

Finnish

Timing:

Spring semester, period 4. Recommended for fourth year of studies.

Learning outcomes:

After completion of the course, the student will be able to explain the effects of mechanical and environmental loads on the possible failure mechanisms in alloys. (S)he will be able to avoid unsuitable choices of materials in various applications. (S)he will be able to list the stages involved in a typical failure analysis. The student will be able to determine the most likely failure mechanism on the basis of the macroscopic and microscopic features of fracture surfaces. (S)he will be able to give rational instructions for avoiding failures.

Contents:

Failure mechanisms at low and high temperatures under static and dynamic loading. Failures caused by corrosion. Macroscopic and microscopic features of fracture surfaces. General principles and approaches to failure analysis. Failures induced by hydrogen. Practical examples of failure cases.

Mode of delivery:

Face to face

Learning activities and teaching methods:

Lectures 32 h / independent study 103 h.

Target group:

Compulsory in the masters stage for all Mechanical Engineering students majoring in Materials Engineering.

Prerequisites and co-requisites:

Before registering for this course the student must have successfully completed the following courses: 465101A An Introduction to Materials for Mechanical Engineering, 465102A Materials for Mechanical Engineering, 465105A Research techniques for materials, and 465107A An Introduction to Physical Metallurgy.

Recommended or required reading:

Study guide and lecture slides. Additional material: Wulpi, D.J.: Understanding How Components Fail, ASM 1985. Engel L. and Klingele H.: Atlas of Metals Damage, Carl Hauser Verlag.

Assessment methods and criteria:

Final grade assessed on the basis of final examination.

Grading:

Pass grades on a scale of 1-5. Grade 0 fail.

Person responsible:

Olli Nousiainen

465107A: Introduction to physical metallurgy, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Nousiainen, Olli Pekka

Opintokohteen kielet: Finnish

ECTS Credits:

5 ects/ 135 hours study time

Language of instruction:

Finnish

Timing:

Lectures and laboratory works, 1. period

Learning outcomes:

The aim of the course is to introduce common crystal structures in metal alloys. A student knows how to describe crystal planes and crystal directions of a cubic crystal structure using Miller indices. He/she also understands the interactions between x-ray radiation (or electronic beam) and metallic specimen. Finally, he /she is able to analyze data obtained from XRD, SEM/EBSD and TEM studies.

Contents:

Crystal strucrture, bonding types, reciprocal lattice, XRD, SEM/EBSD, and TEM.

Mode of delivery:

Face-to face teaching

Learning activities and teaching methods:

32 hours lectures/ 12 hours laboratory exercises/91 hours independent studies. Three laboratory excersises are included in the course.

Prerequisites and co-requisites:

465101A Introduction to materials for mechanical engineering and 465102A Materials for mechanical engineering.

Recommended or required reading:

Lecture booklet (In Finnish). Other material will be announced at the beginning of the course.

Assessment methods and criteria:

Final exam and final report. The final grade is based on the combined points from the exam (factor 0.7) and the report (factor 0.3).

Grading:

Numerical grading scale 1 - 5.

Person responsible:

Olli Nousiainen

465112S: Sheet metal forming, 8 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jari Larkiola

Opintokohteen kielet: Finnish

ECTS Credits:

8 ECTS cr

Language of instruction:

Finnish

Timing:

Spring semester, 3rd and 4th periods.

Learning outcomes:

The course focuses on sheet metal forming methods such as for deep and stretch drawing, hydraulic molding by fluid pressure, incremental molding and roll forming. The methods are compared with the functions of both sheet metal bending machines and bending machines. After completing the course the student will be able to evaluate different manufacturing methods and make the right choices for the effective manufacturing of the desired product. The student is able to compare mold manufacturing methods with cutting machining and can propose suitable cost-optimal materials for the particular application and production environment. In addition, the student understands the importance of simulation in optimizing and selecting the manufacturing process.

Contents:

The course covers the various sheet metal forming methods and the related tooling principles, including cost estimates. Molding methods are accompanied by the plastic behavior of materials to support learning in the selection of materials. In addition, the information obtained through substance testing and its utilization in the selection of molding methods are studied. Moldability evaluations emphasize the stress-strain behavior of materials and their consideration in choosing the material and the correct forming method. The course also covers material selection through different methods and models.

Mode of delivery:

Face to face teaching

Learning activities and teaching methods:

Lectures 38 h, assignment 24 h, excursion and independent studying.

Target group:

Compulsory for the Master's students in the Mechanical Engineering Degree Program.

Prerequisites and co-requisites:

Prerequisites are that the following courses must be completed before enrolling in the course: 465101A Introduction to Mechanical Engineering Materials, 465102A Mechanical Engineering Materials, and 465103A Fundamentals of Editing and Molding.

Recommended or required reading:

Luentomuistiinpanot, Korhonen, A. and Larkiola, J., Ohutlevyjen muovauksen perusteet, Actaoulu C1 2012, 207p, muu luennolla ilmoitettu materiaali

Assessment methods and criteria:

Final exam and assaingment.

Grading:

0-5, 0 is fail.

Person responsible:

Jari Larkiola.

465108S: Modelling of metal forming processes, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jari Larkiola

Opintokohteen kielet: Finnish

ECTS Credits:

5 / 135 h total study time

Language of instruction:

Finnish

Timing:

Autumn semester, periods I & II. Recommended for fourth study year.

Learning outcomes:

Students are initiated into physical models and computer aided modelling of metal forming processes. The object is to give students e.g. readiness of calculate forming forces during plastic deformations utilising simulation softwares.

Contents:

The course will cover traditional physical models related to various methods of shaping and shaping, as well as familiarize with computer-based simulation software (eg Abaqus and / or LS-Dyna). Temperature is an essential factor in hot working and the theory and modeling of heat transfer is one part of the course. In addition to the exam, the course includes assignments.

Mode of delivery:

Face to face

Learning activities and teaching methods:

Lectures 32h, experimental work 20h and independent study 83 h

Target group:

Compulsory in the masters stage for all Mechanical Engineering students majoring in Materials Engineering.

Prerequisites and co-requisites:

465103A Principles of metal shaping and forming

Recommended or required reading:

Lecture notes

Assessment methods and criteria:

Accepted examination (weighting 0.8) and experimental work (weighting 0.2).

Grading:

Examination scale 0-5 ja literature work 0-2. Grade 0 fail.

Person responsible:

Jari Larkiola

465116S: Rolling technology, 10 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jussi Paavola

Opintokohteen kielet: Finnish

Leikkaavuudet:

465090A-01	Rolling Technology, examination	0.0 op
465090A-02	Rolling Technology, exercise	0.0 op
465090A	Rolling Technology	8.0 op

ECTS Credits:

10 ects/270 hours study time

Language of instruction:

Finnish

Timing:

Lectures and laboratory works, I and II periods

Learning outcomes:

The target for the course is for the student to gain knowledge of the basic concepts of the rolling technology, the basic character of the rolling process and some special characteristics also which are related to it. Upon completing the required coursework, the student can explain the effects of hot rolling and cold rolling on the quality of the final product. With the help of the learned theory, the student can explain the significance of the process modeling on the control of the rolling process. Furthermore, the student understands the connection between rolling and materials engineering and can estimate their effect on the manufacturing process and on the quality of the final product.

Contents:

Concepts of the rolling technology and terminology; Basics of the plasticity theory; Calculation of roll force and characteristics of roll gap; Temperature behavior during rolling; Flatness and profile analysis; Accuracy of manufacturing and its statistical applications; Modeling of the rolling process.

Mode of delivery:

Face-to face teaching

Learning activities and teaching methods:

50 hours lectures/ 30 hours laboratory exercises/190 hours independent studies. Three laboratory excersises are included in the course.

Recommended or required reading:

Lecture booklet (In Finnish). Starling: Theory and practise of flat rolling

Assessment methods and criteria:

Final exam.

Grading:

Numerical grading scale 1 - 5.

Person responsible:

Jussi Paavola

465115S: Processing and properties of steels, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Kömi

Opintokohteen kielet: Finnish

Leikkaavuudet:

465089S-01	Processing and Properties of Steels, examination	0.0 op
465089S-02	Processing and Properties of Steels, laboratory exercise	0.0 op
465089S	Processing and Properties of Steels	3.5 op

ECTS Credits:

5 ECTS/135 h study time

Language of instruction:

Finnish

Timing:

Autumn semester period 1. Recommended for 5 th year of studies.

Learning outcomes:

The course covers the stages of steel making and their effects as well as the properties of products. After completing the course, the student will know how to make modern steels, will be able to name the main types of steels and understand how their good qualities have been achieved and where development is

going. In addition, he is able to explain metallurgical phenomena in heat treatment and thermomechanical treatment, and especially the techniques used to grind grain size. Environment, recyclability and CO2 emissions are an essential part of the course content.

Contents:

Production of molten steel, forging, continuous casting and rolling. Thermal and thermomechanical treatments and their effect on the properties of steels. Different types of steels, their properties and use. Environment, recyclability and emissions.

Mode of delivery:

Face to face

Learning activities and teaching methods:

Lectures 32 h / independent study and assignment / excursion; 103 h.

Target group:

Compulsory in the master's stage for all Mechanical Engineering students majoring in Materials Engineering.

Prerequisites and co-requisites:

Before registering for this course the student must have successfully completed the following courses: 465101A An Introduction to Materials for Mechanical Engineering, 465102A Materials for Mechanical Engineering, 465107A An Introduction to Physical Metallurgy.

Recommended or required reading:

Study guide and lecture presentations.

Assessment methods and criteria:

Final grade assessed on the basis of a final examination.

Grading:

Pass grades on a scale of 1-5. Grade 0 fail.

Person responsible:

Professor Jukka Kömi

465114S: Exercises in physical metallurgy, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Anna Kisko

Opintokohteen kielet: Finnish

Leikkaavuudet:

465084S	Exercises in Physical Metallurgy	4.0 op
465084S-01	Exercise 1 in Physical Metallurgy	0.0 op
465084S-02	Exercise 2 in Physical Metallurgy	0.0 op
465084S-03	Exercise 3 in Physical Metallurgy	0.0 op

ECTS Credits:

5 ects/135 hours study time

Language of instruction:

Finnish

Timing:

Exercises are possible to do after 465109S Microstructural changes in metallic alloys and 465110S Strength of metallic alloys.

Learning outcomes:

This course aims at giving the student the skills to find and use of materials engineering literature and to write a clear, well arranged report. The student also will become familiar with some topic areas of physical metallurgy on a deeper level. After the course, the student is capable of finding relevant and reliable literature on the topic of his/her research work. In addition, he/she is able to use this literature for solving his /her research problem and for preparing a well arranged research report. In the future, the student will be able to go deep into essential matters of his/her research subject of physical metallurgy.

Contents:

Physical metallurgy

Mode of delivery:

Face-to face teaching

Learning activities and teaching methods:

The course consists of three personal less extended experimental or literary works on given topics. Each exercise includes a report. Timing is free.

Prerequisites and co-requisites:

465109S Microstructural changes in metallic alloys and 465110S Strength of metallic alloys.

Recommended or required reading:

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

Assessment methods and criteria:

The final grade is based on the combined points from the exercises.

Grading:

Numerical grading scale 1 - 5.

Person responsible:

Anna Kisko

Working life cooperation:

Yes

460004S: Practical Training II, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Practical training
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Reijo Saari
Opintokohteen kielet: Finnish
Leikkaavuudet:

485002S	Advanced Practical Training	5.0 op
460002S	Practical Training II	3.0 op

Ei opintojaksokuvauksia.

A460224: Module of the Option/Mechactronics and Machine Diagnostics, Mechatronics, 40 op

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

Ei opintojaksokuvauksia.

e

462108S: Mechatronics, 6 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Liedes, Toni Mikael

Opintokohteen kielet: Finnish

Leikkaavuudet:

462051S Mechatronics 5.0 op

ECTS Credits:

6 / 160 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the spring semester, during periods III and IV. It is recommended to complete the course at the 4th spring semester.

Learning outcomes:

Upon completion of the course, the student will be able to explain the definition of mechatronics. He/she is able to divide a mechatronic system into its elementary units and he/she is able to explain the significance and interfaces of the various units. The student is able to analyze the kinematic and dynamic properties of mechanisms. Furthermore, the student is able to construct control profiles for actuators driving mechanisms. The student is able to describe the difference between kinematic and inverse kinematic problem, which he/she can also solve. In addition to this, the student is able to determine the basic structure of a digital control system. He/she is able to evaluate the preconditions for digital control as well as the requirements for hardware.

Contents:

Simulation and modelling of mechatronic systems; Actuators suitable for servo control; Basics of control systems; Sensors in closed-loop applications; Determination of control profiles; Kinematics and inverse kinematics of mechanisms.

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

Lectures 32 h / Group work 16 h / Self-study 112 h

Target group:

Master's degree students of mechanical engineering

Prerequisites and co-requisites:

The recommended prerequisite is the completion of the following courses prior to enrolling for the course: Machine Sensor Technology

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:

de Silva, Clarence W. Mechatronics: An Integrated Approach. CRC Press, 2005, 1312 p; Lecture notes.

Assessment methods and criteria:

This course utilizes continuous assessment. The assessment can be based on learning diary, exercises, seminars and exam. The more detailed assessment criteria are available on the Noppa Study Portal.

Grading:

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

Person responsible:

Lecturer Toni Liedes

462109S: Simulation and modelling of machines, 8 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Liedes, Toni Mikael

Opintokohteen kielet: Finnish

Leikkaavuudet:

462055S-01	Virtual Engineering of Mechatronic Products, examination	0.0 op
462055S-02	Virtual Engineering of Mechatronic Products, exercise work	0.0 op
462055S	Virtual Engineering of Mechatronic Products	5.0 op

ECTS Credits:

8 cr / 213 hours of work

Language of instruction:

Finnish

Timing:

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

Learning outcomes:

Upon completion of the course, the student will be able to create a simulation model consisting of rigid bodies using Adams and MATLAB/Simulink software. The student is able to interpret the simulation results and is also able to evaluate the validity of the results. The student is able to design submodels of complex systems and he/she is able to explain the principles of creating a more complex simulation model. In addition to this, the student is able to evaluate the extent of modelling process of various kinds of engineering systems.

Contents:

Basics of virtual design; ADAMS simulation software principles and basic usage; Creation and usage of multibody systems comprised of rigid bodies; Kinematic and dynamic analysis; Determination of actuator motion paths and velocities as well as determination of loads; Modelling and simulation of control systems.

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

Lectures 32 h / Group work 32 h / Self-study 149 h

Target group:

Master's degree students of mechanical engineering

Prerequisites and co-requisites:

The recommended prerequisite is the completion of the following courses prior to enrolling for the course.

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 handout. Other material is in the beginning of the course.

Assessment methods and criteria:

This course utilizes continuous assessment. The assessment can be based on learning diary, exercises, seminars and exam. The more detailed assessment criteria are available on the Noppa Study Portal.

Grading:

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

Person responsible:

Lecturer Toni Liedes

462110S: Advanced course in mechatronics, 8 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Liedes, Toni Mikael

Opintokohteen kielet: Finnish

Leikkaavuudet:

462052S Advanced Course in Mechatronics 8.0 op

ECTS Credits:

8 cr / 213 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the autumn semester, during periods 1 and 2. It is recommended to complete the course at the 5th autumn semester.

Learning outcomes:

Upon completion of the course, the student will be able to analyze and design mechatronic products using modern calculation and simulation methods. The student is able to choose the appropriate technology for a mechatronic system. He/she is also able to compare the various technologies. In addition to this, the student is able to assess the feasibility, performance and preconditions of different kinds of actuators in mechatronic products.

Contents:

Technology of digital control systems; Characteristics of dynamical systems and their behavior in time and frequency domain; Modelling and simulation of mechatronic systems; Basics of advanced vibration damping systems and their control; Modelling of friction; Experimental research of mechatronic systems.

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

Lectures 16 h / Group work 32 h / Self-study 165 h

Target group:

Master's degree students of mechanical engineering

Prerequisites and co-requisites:

The recommended prerequisite is the completion of the following courses prior to enrolling for the course: Actuators in Machine Automation, Mechatronics, Simulation and Modelling of Machines

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:

de Silva, Clarence W. Mechatronics: An Integrated Approach. CRC Press, 2005, 1312 p; Lecture notes.

Assessment methods and criteria:

This course utilizes continuous assessment. The assessment can be based on learning diary, exercises, seminars, assignment and exam. The more detailed assessment criteria are available on the Noppa Study Portal.

Grading:

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

Person responsible:

Lecturer Toni Liedes

477621A: Control System Analysis, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Hiltunen, Jukka Antero

Opintokohteen kielet: Finnish

Leikkaavuudet:

477602A	Control System Analysis	4.0 op

ECTS Credits:

5 ECTS / 133 hours of work

Language of instruction:

Finnish (available in English as a book exam: students will receive materials to study and take an final exam based on those materials)

Timing:

Period 1 (autumn term)

Learning outcomes:

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

Contents:

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

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures and exercises

Target group:

B.Sc. students in process and environmental engineering

Prerequisites and co-requisites:

The courses 477011P Introduction to process and environmental engineering I, 488010P Introduction to process and environmental engineering II, and 477051A Automation engineering recommended beforehand

Recommended optional programme components:

None

Recommended or required reading:

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

Assessment methods and criteria:

Exam and in addition extra points from homeworks

Grading:

Numerical grading scale 1-5 or fail

Person responsible:

Jukka Hiltunen ja Enso Ikonen

Working life cooperation:

No

461112S: Mechanical vibrations, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Laukkanen, Jari Jussi

Opintokohteen kielet: Finnish

Leikkaavuudet:

461019S-01	Mechanical Vibrations, examination	0.0 op
461019S-02	Mechanical Vibrations, exercises	0.0 op
461019S	Mechanical Vibrations	6.0 op

ECTS Credits:

5 ects /135 hous of work

Language of instruction:

Finnish

Timing:

Lectures and exercises during the periods 3 - 4.

Learning outcomes:

The aim of this course is to familiarize students with the principles and phenomena of mechanical vibrations and show how different vibrations can be represented by a theoretical model and how detrimental vibrations can be avoided in structures and machines.
Learning outcomes: After the course, the student is capable of forming the equations of motion for a single and multi-degree-of-freedom systems and continuous models and is able to solve them using analytical, numerical and approximate methods. Moreover, the student is able to use finite element methods to solve basic vibration problems.

Contents:

Basic principles; Vibrations of single degree-of-freedom systems; Vibrations of multi-degree-of-freedom systems; Torsional vibration of a power drive chain; Longitudinal, transverse and torsional vibrations of a beam represented by a continuous model; Some approximation methods; Use of FEM in vibration analysis; Introduction to the theory of balancing; Experimental modal analysis.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

This course will be based on lectures 45 h and exercises 30 h and 45 h self-study during periods 3 – 4 and 15 h for a project work. Students are required to take a final exam or mid-term exams.

Prerequisites and co-requisites:

First year mathematics, Strength of Materials I & II and Dynamics.

Recommended or required reading:

Pramila, A.: Värähtelymekaniikka, Chap. 10: Koneenosien suunnittelu 4, WSOY, 1985. James, M.L. & al.: Vibration of Mechanical and Structural Systems: With Microcomputer Applications, Harper & Row, 1989.

Assessment methods and criteria:

The grade of the course is based on midterm exams or a final examination. The student must pass the exercises before taking the examination.

Grading:

Numerical grading scale 1-5.

Person responsible:

Jari Laukkanen

521301A: Digital Techniques 1, 8 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Lahti

Opintokohteen kielet: Finnish

Leikkaavuudet:

521412A-02 Digital Techniques 1, Exercise Work 0.0 op

521412A Digital Techniques 1 6.0 op

521412A-01 Digital Techniques, Exam 0.0 op

ECTS Credits:

8

Language of instruction:

Finnish

Timing:

Periods 3-4

Learning outcomes:

1. 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.
2. 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.
3. Based on this knowledge, students are able to implement and analyze digital devices consisting of ordinary simple digital components.
4. 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:

The principles of digital devices, Boolean algebra, numeral systems, operating principle, analysis and synthesis of combinational logic, flip-flops, operating principle, analysis and synthesis of sequential logic (state machines), physical characteristics of CMOS technology, registers and register transfers, computer memory, instruction set architecture, computer design basics, interfaces and data transmission.

Mode of delivery:

Classroom

Learning activities and teaching methods:

Lessons 40 h, weekly home assignments.

Target group:

Primarily 1st year electrical engineering and computer science and engineering BSc students. The course can be taken by the students of the university of Oulu.

Prerequisites and co-requisites:

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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:

Text books, MIT OpenCourseWare and execise literature.

Assessment methods and criteria:

Project work and home assignments
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Project work and home assignments are assessed on numerical scale 1-5. The average of project work and home assignments will be the final grade.

Person responsible:

Antti Mäntyniemi

Working life cooperation:

-

Other information:

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460004S: Practical Training II, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Practical training
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Reijo Saari
Opintokohteen kielet: Finnish
Leikkaavuudet:

485002S	Advanced Practical Training	5.0 op
460002S	Practical Training II	3.0 op

Ei opintojaksokuvauksia.

A460225: Module of the Option/Mechactronics and Machine Diagnostics, Machine Diagnostics, 41,5 op

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

Ei opintojaksokuvauksia.

eng

462111S: Machine diagnostics, 10 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Jouni Laurila
Opintokohteen kielet: Finnish
Leikkaavuudet:

464088S	Diagnosis of Machine Condition	8.0 op
464088S-01	Diagnosis of Machine Condition, examination	0.0 op

464088S-02 Diagnosis of Machine Condition, exercises 0.0 op

ECTS Credits:

10 ECTS credits / 270 hours of work

Language of instruction:

Finnish

Timing:

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

Learning outcomes:

After completing the course the student will be able to use various methods of machine diagnostics and use the most common measuring devices to determine the functioning and condition of machines. He / she is able to apply the key indicators and signal processing methods used in condition monitoring and to analyze the frequency content of signals in order to solve problems related to the operation of machines. They will be able to draw up a measurement plan, make measurements, analyze the data obtained and report the results obtained. He / she is also able to evaluate what factors affect the reliability and comparability of measurements. The student is able to use industry standards to help evaluate the condition of machinery and the vibration intensity. They will be able to understand the importance of machine diagnostics in the success and productivity of maintenance.

Contents:

Major methods and measurement techniques used in machine diagnostics, machine vibration analysis and fault detection, key signal processing methods, measurement design, implementation and reporting, machine balancing, industry standards.

Mode of delivery:

Face-to-face teaching

Target group:

Master's degree students in the mechanical engineering

Prerequisites and co-requisites:

The recommended prequisite is the completion of the following course: 462107A Maintenance of Machines, 462105A Sensor technology for Machines.

Recommended optional programme components:

The course is an independent entity.

Recommended or required reading:

Lecture handout and the other material delivered during the course. Supplementary readings: Mills, S.R. W., Vibration Monitoring & Analysis Handbook, BINDT, 2010. Mikkonen, H. (toim.), Kuntoon perustuva kunnossapito, KP-Media Oy, 2009. PSK-käsikirja 3: Kunnonvalvonnan värähtelymittaus, PSK Standardisointiyhdistys ry, 2019.

Assessment methods and criteria:

Final examination and the other graded assignments

Grading:

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

Person responsible:

Jouni Laurila

462112S: Measuring instruments in machine diagnostics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Konsta Antero Karioja

Opintokohteen kielet: Finnish

Leikkaavuudet:

464089S-01 Measuring Instrumentation and Techniques for Diagnosis of Machine Condition, examination 0.0 op

464089S-02 Measuring Instrumentation and Techniques for Diagnosis of Machine Condition, exercises 0.0 op

464089S Measuring Instrumentation and Techniques for Diagnosis of Machine Condition 5.0 op

ECTS Credits:

5 ECTS credits / 135 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the autumn semester, during period 1 and 2. It is recommended to complete the course at the 5th autumn semester.

Learning outcomes:

After completing the course, the student will be able to design, construct and calibrate the various measurement chains needed in machine diagnostics. They are able to use data loggers, analyzers, PC-based measurement systems, data acquisition cards and various filters, and other typical measuring instruments and know how they work, which is central to test diagnostics. The student also identifies the most important sources of error that affect the reliability and comparability of measurement results.

Contents:

Sensors and instrumentation for machine diagnostics, other equipment, design of measurement systems, evaluation and calibration of performance, and main signal processing methods in machine diagnostics.

Mode of delivery:

Face-to-face teaching

Target group:

Master's degree students in the mechanical engineering

Prerequisites and co-requisites:

The recommended prequisite is the completion of the following courses: 462105A Sensor technology for machines, 462107A Maintenance of Machines and 462111S Machine Diagnostics.

Recommended optional programme components:

The course is an independent entity.

Recommended or required reading:

Lecture handout and the other material delivered during the course. Supplementary readings: Mills, S.R. W., Vibration Monitoring & Analysis Handbook, BINDT, 2010. Mikkonen, H. (toim.), Kuntoon perustuva kunnossapito, KP-Media Oy, 2009. PSK-käsikirja 3 – Kunnonvalvonnan värähtelymittaus, PSK Standardisointiyhdistys ry, 2012.

Assessment methods and criteria:

Final examination and the other graded assignments

Grading:

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

Person responsible:

Konsta Karioja

461112S: Mechanical vibrations, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Laukkanen, Jari Jussi

Opintokohteen kielet: Finnish

Leikkaavuudet:

461019S-01 Mechanical Vibrations, examination 0.0 op

461019S-02 Mechanical Vibrations, exercises 0.0 op

461019S Mechanical Vibrations 6.0 op

ECTS Credits:

5 ects /135 hous of work

Language of instruction:

Finnish

Timing:

Lectures and exercises during the periods 3 - 4.

Learning outcomes:

The aim of this course is to familiarize students with the principles and phenomena of mechanical vibrations and show how different vibrations can be represented by a theoretical model and how detrimental vibrations can be avoided in structures and machines.
Learning outcomes: After the course, the student is capable of forming the equations of motion for a single and multi-degree-of-freedom systems and continuous models and is able to solve them using analytical, numerical and approximate methods. Moreover, the student is able to use finite element methods to solve basic vibration problems.

Contents:

Basic principles; Vibrations of single degree-of-freedom systems; Vibrations of multi-degree-of-freedom systems; Torsional vibration of a power drive chain; Longitudinal, transverse and torsional vibrations of a beam represented by a continuous model; Some approximation methods; Use of FEM in vibration analysis; Introduction to the theory of balancing; Experimental modal analysis.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

This course will be based on lectures 45 h and exercises 30 h and 45 h self-study during periods 3 – 4 and 15 h for a project work. Students are required to take a final exam or mid-term exams.

Prerequisites and co-requisites:

First year mathematics, Strength of Materials I & II and Dynamics.

Recommended or required reading:

Pramila, A.: Värähtelymekaniikka, Chap. 10: Koneenosien suunnittelu 4, WSOY, 1985. James, M.L. & al.: Vibration of Mechanical and Structural Systems: With Microcomputer Applications, Harper & Row, 1989.

Assessment methods and criteria:

The grade of the course is based on midterm exams or a final examination. The student must pass the exercises before taking the examination.

Grading:

Numerical grading scale 1-5.

Person responsible:

Jari Laukkanen

465113S: Failure mechanisms in metals, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Nousiainen, Olli Pekka

Opintokohteen kielet: Finnish

Leikkaavuudet:

465079S Failure Analysis 3.5 op

ECTS Credits:

5 ECTS/135 h study time

Language of instruction:

Finnish

Timing:

Spring semester, period 4. Recommended for fourth year of studies.

Learning outcomes:

After completion of the course, the student will be able to explain the effects of mechanical and environmental loads on the possible failure mechanisms in alloys. (S)he will be able to avoid unsuitable choices of materials in various applications. (S)he will be able to list the stages involved in a typical failure analysis. The student will be able to determine the most likely failure mechanism on the basis of the macroscopic and microscopic features of fracture surfaces. (S)he will be able to give rational instructions for avoiding failures.

Contents:

Failure mechanisms at low and high temperatures under static and dynamic loading. Failures caused by corrosion. Macroscopic and microscopic features of fracture surfaces. General principles and approaches to failure analysis. Failures induced by hydrogen. Practical examples of failure cases.

Mode of delivery:

Face to face

Learning activities and teaching methods:

Lectures 32 h / independent study 103 h.

Target group:

Compulsory in the masters stage for all Mechanical Engineering students majoring in Materials Engineering.

Prerequisites and co-requisites:

Before registering for this course the student must have successfully completed the following courses: 465101A An Introduction to Materials for Mechanical Engineering, 465102A Materials for Mechanical Engineering, 465105A Research techniques for materials, and 465107A An Introduction to Physical Metallurgy.

Recommended or required reading:

Study guide and lecture slides. Additional material: Wulpi, D.J.: Understanding How Components Fail, ASM 1985. Engel L. and Klingele H.: Atlas of Metals Damage, Carl Hauser Verlag.

Assessment methods and criteria:

Final grade assessed on the basis of final examination.

Grading:

Pass grades on a scale of 1-5. Grade 0 fail.

Person responsible:

Olli Nousiainen

521301A: Digital Techniques 1, 8 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Electrical Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Lahti

Opintokohteen kielet: Finnish

Leikkaavuudet:

521412A-02 Digital Techniques 1, Exercise Work 0.0 op

521412A Digital Techniques 1 6.0 op

521412A-01 Digital Techniques, Exam 0.0 op

ECTS Credits:

8

Language of instruction:

Finnish

Timing:

Periods 3-4

Learning outcomes:

1. 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.
2. 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.
3. Based on this knowledge, students are able to implement and analyze digital devices consisting of ordinary simple digital components.
4. 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:

The principles of digital devices, Boolean algebra, numeral systems, operating principle, analysis and synthesis of combinational logic, flip-flops, operating principle, analysis and synthesis of sequential logic (state machines), physical characteristics of CMOS technology, registers and register transfers, computer memory, instruction set architecture, computer design basics, interfaces and data transmission.

Mode of delivery:

Classroom

Learning activities and teaching methods:

Lessons 40 h, weekly home assignments.

Target group:

Primarily 1st year electrical engineering and computer science and engineering BSc students. The course can be taken by the students of the university of Oulu.

Prerequisites and co-requisites:

-

Recommended optional programme components:

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

Recommended or required reading:

Text books, MIT OpenCourseWare and execise literature.

Assessment methods and criteria:

Project work and home assignments
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Project work and home assignments are assessed on numerical scale 1-5. The average of project work and home assignments will be the final grade.

Person responsible:

Antti Mäntyniemi

Working life cooperation:

-

Other information:

-

031077P: Complex analysis, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Applied Mathematics and Computational Mathematics

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Kemppainen

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay031077P Complex analysis (OPEN UNI) 5.0 op

031018P Complex Analysis 4.0 op

ECTS Credits:

5 ECTS credits / 135 hours of work

Language of instruction:

Finnish

Timing:

Fall semester, period 1.

Learning outcomes:

After completing the course the student

1. is able to calculate the derivative and the integral of functions of complex variable,
2. understands the concept of analyticity
3. is capable of calculating the contour integrals and using the theory of residues for computing the line integrals, will be able to apply the techniques of complex analysis to simple problems in signal processing.

Contents:

Complex numbers and functions, complex derivative and analyticity, complex series, Cauchy's integral theorem, Laurent and Taylor expansions, theory of residues, applications to signal analysis.

Mode of delivery:

Face-toface teaching, Stack(web-based too) exercises.

Learning activities and teaching methods:

Lectures 28 h/Exercises 14 h/Self study 93 h.

Target group:

The students in the engineering sciences. The other students are welcome, too.

Prerequisites and co-requisites:

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

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:

The lecture notes

Assessment methods and criteria:

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

Grading:

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

Person responsible:

Jukka Kemppainen

Working life cooperation:

-

461107A: Finite Element Methods I, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Lumijärvi, Jouko Veikko Juhani

Opintokohteen kielet: Finnish

Leikkaavuudet:

461033A	Finite Element Methods I	3.5 op
461033A-01	Finite Element Methods I, examination	0.0 op
461033A-02	Finite Element Methods I, exercises	0.0 op

ECTS Credits:

5 ECTS credits / 132 hours of work

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. After this course, the student can explain the basic idea of the FEM. He/she can analyze simple truss-, frame- and plane structures and explain the theoretical background of the calculations.

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.-2.

Target group:

Students of the bachelor's stage of the Mechanical Engineering Degree Programme.

Prerequisites and co-requisites:

Strength of Materials I and II and Fundamentals of mechanical computing and programming

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:

The grade of the course is based on a final exam. The student must pass the exercises before taking the examination.

Grading:

Numerical grading scale 1-5.

Person responsible:

Jouko Lumijärvi

460004S: Practical Training II, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Practical training
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Reijo Saari
Opintokohteen kielet: Finnish
Leikkaavuudet:

485002S	Advanced Practical Training	5.0 op
460002S	Practical Training II	3.0 op

Ei opintojaksokuvauksia.

A460228: Module of the Option, Engineering Mechanics, 40 op

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

Ei opintojaksokuvauksia.

engla

461113S: Finite element methods III, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Lumijärvi, Jouko Veikko Juhani
Opintokohteen kielet: Finnish
Leikkaavuudet:

461020S-01	Advanced Course in Finite Element Methods, examination	0.0 op
461020S-02	Advanced Course in Finite Element Methods, exercises	0.0 op
461020S	Advanced Course in Finite Element Methods	5.0 op

ECTS Credits:

5 ECTS credits / 132 hours of work

Language of instruction:

Finnish

Timing:

Lectures and exercises, periods 1.-2.

Learning outcomes:

The aim of the course is to give students an enhanced understanding of the finite element method and to familiarize students with the analysis of non-linear problems.

Learning outcomes: Upon completion of this course, the student is able to apply the finite element method in analyzing the most important non-linear phenomena in engineering mechanics. He/she is able to choose suitable modeling and solution methods for different phenomena

Contents:

Static and dynamic non-linear phenomena in engineering mechanics: Geometric nonlinearity, buckling, contact problems and non-linear material models.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures and exercises take place during periods 1.-3. The course can be passed by a final exam.

Prerequisites and co-requisites:

Finite Element Methods I, Finite Element Methods II.

Recommended or required reading:

Lecture notes (in Finnish), Belytschko, T., Liu, W. K., Moran, B.: Finite Elements for Nonlinear Continua and Structures, John Wiley & Sons Ltd., 2000, Bathe, K.-J.: Finite Element Procedures, Prentice-Hall, 1996, Hinton, E.: NAFEMS Introduction to Nonlinear Finite Element Analysis, Bell and Bain Ltd., 1992.

Assessment methods and criteria:

The grade of the course is based on a final exam. The student must pass the exercises before taking the examination.

Grading:

Numerical grading scale 1-5.

Person responsible:

Jouko Lumijärvi

461110S: Fluid mechanics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Koivurova Hannu

Opintokohteen kielet: Finnish

Leikkaavuudet:

461036S-01	Heat and Mass Transfer II, examination	0.0 op
461036S-02	Heat and Mass Transfer II, exercises	0.0 op
461036S	Heat and Mass Transfer II	3.5 op

ECTS Credits:

5 ECTS credits / 105 hours of work

Language of instruction:

Finnish

Timing:

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

Learning outcomes:

The aim of the course is to get acquainted with the basic concepts of flow technology, terminology, techniques for solving the main flow phenomena and flow problems and their application. After completing the course, the student will be able to use the terminology of flow mechanics and will be able to explain what the basic concepts of flow mechanics mean, what principles are the basic equations of flow mechanics and how the equations can be simplified. The student can explain the basic idea of dimensional analysis and apply it in flow mechanics, for example, to scale test results. The student will be able to solve simple flow problems, such as determining the volume flow, pressure drop or pump lift height of the piping and determining the forces and moments affecting the parts based on the flow velocities.

Contents:

Special features of fluids, statics of fluids, application of the ideal flow or Bernoulli equation, global equations of flow, ie flow rate equations, local flow equations and viscous flow, tube flow and its special features and dimensional analysis.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 30 h / Exercise 30 h / Self-study 45 h.

Prerequisites and co-requisites:

Recommended: Thermodynamics, dynamics and statics.

Recommended optional programme components:

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

Recommended or required reading:

Nakayama, Boucher, Introduction to Fluid Mechanics, Bathsworth-Heideman, 2000; Gerhart, Gerhart, Hochstein, Munson's fluid mechanics, John Wiley & Sons, Inc 2017; Munson, Rothmayer, Okiishi, Huebsch: Fluid mechanics, Wiley 2013. 7th ed.

Assessment methods and criteria:

The course is taken in the final exam. In addition, students complete homework throughout the course, which is assessed. One-third of homework assignments must be counted as approved. You can take the exam only after you have successfully completed your homework. The assessment of the course is based on the learning outcomes of the course. More detailed assessment criteria can be found in Moodle's course pages.

Grading:

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

Person responsible:

University Lecturer Hannu Koivurova

461115S: Fracture mechanics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Laukkanen, Jari Jussi

Opintokohteen kielet: Finnish

Leikkaavuudet:

461021S-01	Fracture Mechanics, examination	0.0 op
461021S-02	Fracture Mechanics, exercises	0.0 op
461021S	Fracture Mechanics	5.0 op

ECTS Credits:

5 ects /135 hous of work

Language of instruction:

Finnish

Timing:

Lectures and exercises during the periods 3 - 4.

Learning outcomes:

The aim of the course is to familiarise students with the fracture of materials and with the use of fracture mechanics in design, which has become popular in machine construction and especially in the design of welded steel structures.

Learning outcomes: Upon completion of the course, a student should be able to know the fracture mechanisms and influence of material properties to them. He/ She is also able to solve linear elastic fracture mechanics problems using tablebooks. Moreover the student is able to solve fatigue crack growth problems. The student is able to use finite element method to solve fracture mechanics problems. After the course the student has the basic skills to use fracture mechanics in design.

Contents:

Fracture mechanisms. Influence of material properties. Linear elastic fracture mechanics. Advanced fracture mechanics. Energy principles. Fatigue crack growth. Experimental methods.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

This course will be based on lectures 45 h and exercises 30 h and 45 h self-study during periods 3 – 4 and 15 h for a project work. Students are required to take a final exam.

Prerequisites and co-requisites:

Courses 461103A, 4611104A and 461108A , recommended 465102A.

Assessment methods and criteria:

Final exam. After the passed exercises a student is allowed to take part in an exam.

Grading:

Numerical grading scale 1-5.

Person responsible:

University Teacher Jari Laukkanen

461116S: Experimental methods in engineering mechanics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Koivurova Hannu

Opintokohteen kielet: Finnish

Leikkaavuudet:

461028S-01	Experimental Methods in Engineering Mechanics, examination	0.0 op
461028S-02	Experimental Methods in Engineering Mechanics, exercises	0.0 op
461028S	Experimental Methods in Engineering Mechanics	6.0 op

ECTS Credits:

5 ECTS credits / 90 hours of work

Language of instruction:

Finnish

Timing:

Autumn semester

Learning outcomes:

The course focuses on experimental methods in engineering mechanics, where the student becomes familiar with measurements principles, application potentials and constraints. Learning outcomes: Student can make strain gage and vibration measurements in engineering mechanics field of know-how. With modal analysis tests, student can prepare measurements, make tests and estimate accuracy of the results and compare them to calculated results. He/she can find out characteristic magnitudes from the measurements. He/she can independently make strain gage measurements and estimate the inaccuracies.

Contents:

Strain gage and vibration measurements. Modal analysis tests.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Exercise 30 h / Self-study 60 h.

Prerequisites and co-requisites:

Recommended: Vibration Mechanics, Strenght Theory I & II.

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:

Mase, G., Smelser, R., Mase , G. (2010) Continuum Mechanics for Engineers. CRC Press Inc. Oheiskirjallisuus: Malvern, L. (1969) Introduction to the mechanics of a continuous medium. Prentice-Hall, Englewood Cliffs; Mattiasson, K. (1981) Continuum mechanics principles for large deformation problems in solid and structural mechanics. Publ. 81:6, Department of Structural Mechanics, Chalmers University of Technology; Fung, Y. (1965) Foundations of solid mechanics. Prentice-Hall, Englewood Cliffs.

Assessment methods and criteria:

The final grade is based on the combined points from exercises and final exam.The assessment of the course is based on the learning outcomes of the course. The more detailed assessment criteria are available on the Moodle Study Portal.

Grading:

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

Person responsible:

University Lecturer Hannu Koivurova

461111S: Continuum mechanics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Koivurova Hannu

Opintokohteen kielet: Finnish

Leikkaavuudet:

461026S-01	Continuum Mechanics, examination	0.0 op
461026S-02	Continuum Mechanics, exercises	0.0 op
461026S	Continuum Mechanics	6.0 op

ECTS Credits:

5 ECTS credits / 90 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the spring semester, during periods 3 and 4.

Learning outcomes:

The aim of the course is to provide the student with the basic knowledge, concepts and mathematical methods of modeling the behavior of a solid body under load that enables them to apply nonlinear models in elemental method analysis. The student is able to apply tensor computation and knows the most important characteristics of a symmetric second order tensor. He / she can explain the difference between linear and non-linear deformation and Euler and Lagrange's presentation. He / she is able to calculate the deformation of a part using the most important measures of the deformation state and can calculate the time derivatives of the measurements. The student recognizes stress measurements in different configurations, is able to convert them to different configurations and to calculate their objective velocity quantities. The student is able to explain objective observation and objective quantities. He / she can explain and present the concepts and mathematical representations of the second main rule of equilibrium

and balance equilibrium and thermodynamics: mass balance, momentum and momentum balance, energy balance and entropy equation. The student is able to apply elastic and plastic material models to structural analysis and understands the related concepts.

Contents:

Fundamentals of tensor computation, concepts and theory of deformation and stress states in both linear and nonlinear cases, objectivity and time derivatives of quantities, survival theorems of continuum mechanics, methods of describing material properties, and introduction to nonlinear elastic materials and three-dimensional plastics.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 30 h / Exercise 30 h / Self-study 30 h.

Prerequisites and co-requisites:

Recommended: Materials Mechanics.

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:

Mase, G., Smelser, R., Mase , G. (2010) Continuum Mechanics for Engineers. CRC Press Inc. Oheiskirjallisuus: Malvern, L. (1969) Introduction to the mechanics of a continuous medium. Prentice-Hall, Englewood Cliffs; Holzapfel, G.A. (2000) Nonlinear solid mechanics - A continuum approach for engineering, Wiley; Bonet, Wood, (2008) Nonlinear Continuum Mechanics for Finite Element Analysis, 2. ed. Cambridge University Press.

Assessment methods and criteria:

The course is taken in the final exam. In addition, the students complete homework throughout the course, which is assessed. One-third of homework assignments must be counted as approved. You can take the exam only after you have successfully completed your homework. The assessment of the course is based on the learning outcomes of the course. More detailed assessment criteria can be found in Moodle's course pages.

Grading:

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

Person responsible:

University Lecturer Hannu Koivurova

461112S: Mechanical vibrations, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Laukkanen, Jari Jussi

Opintokohteen kielet: Finnish

Leikkaavuudet:

461019S-01	Mechanical Vibrations, examination	0.0 op
461019S-02	Mechanical Vibrations, exercises	0.0 op
461019S	Mechanical Vibrations	6.0 op

ECTS Credits:

5 ects /135 hous of work

Language of instruction:

Finnish

Timing:

Lectures and exercises during the periods 3 - 4.

Learning outcomes:

The aim of this course is to familiarize students with the principles and phenomena of mechanical vibrations and show how different vibrations can be represented by a theoretical model and how detrimental vibrations can be avoided in structures and machines.
Learning outcomes: After the course, the student is capable of forming the equations of motion for a single and multi-degree-of-freedom systems and continuous models and is able to solve them using analytical, numerical and approximate methods. Moreover, the student is able to use finite element methods to solve basic vibration problems.

Contents:

Basic principles; Vibrations of single degree-of-freedom systems; Vibrations of multi-degree-of-freedom systems; Torsional vibration of a power drive chain; Longitudinal, transverse and torsional vibrations of a beam represented by a continuous model; Some approximation methods; Use of FEM in vibration analysis; Introduction to the theory of balancing; Experimental modal analysis.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

This course will be based on lectures 45 h and exercises 30 h and 45 h self-study during periods 3 – 4 and 15 h for a project work. Students are required to take a final exam or mid-term exams.

Prerequisites and co-requisites:

First year mathematics, Strength of Materials I & II and Dynamics.

Recommended or required reading:

Pramila, A.: Värähtelymekaniikka, Chap. 10: Koneenosien suunnittelu 4, WSOY, 1985. James, M.L. & al.: Vibration of Mechanical and Structural Systems: With Microcomputer Applications, Harper & Row, 1989.

Assessment methods and criteria:

The grade of the course is based on midterm exams or a final examination. The student must pass the exercises before taking the examination.

Grading:

Numerical grading scale 1-5.

Person responsible:

Jari Laukkanen

464106S: Production machine design, Paper machinery, 10 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

464074S-01	Paper Machinery Construction, examination	0.0 op
464074S-02	Paper machinery construction, seminar	0.0 op
464074S	Paper Machinery Construction	7.0 op

ECTS Credits:

10 ects / 267 hours of studying work

Language of instruction:

Finnish, can be completed in English as a book examination

Timing:

Lectures and seminars arranged during autumn and spring periods 1.- 3.

Learning outcomes:

Upon completion of this course the students can describe the most common problems of the production machines and know the effects of machine constructions to quality and production. During the course papermachine is used as an example of production machines. After the course students can explain the importance of the pulp and paper industry to domestic economy and can describe the main stages of paper making processes.

Contents:

Fundamentals of production machine structures and their design criteria. Detailed design criteria of paper machine parts, calenders, rolls as well as construction materials.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 100 h / seminars 12 h / company excursions 30 h / individual studies 60 h.

Target group:

Master's degree students of mechanical engineering or process engineering

Recommended or required reading:

Copies of lecture material

Assessment methods and criteria:

Two midterm exams or one final exam is required and accepted seminar.

Grading:

Numerical grading scale 1-5 / fail

Person responsible:

professor Juhani Niskanen

460004S: Practical Training II, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Practical training
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Reijo Saari
Opintokohteen kielet: Finnish
Leikkaavuudet:

485002S	Advanced Practical Training	5.0 op
460002S	Practical Training II	3.0 op

Ei opintojaksokuvauksia.

A460230: Module of the Option, Production Technology, 43,5 op

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

Ei opintojaksokuvauksia.

e

463107S: Manufacturing technology II, 20 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Pirkola, Heikki Juhani, Jyri Porter, Niskanen, Jari Ensio

Opintokohteen kielet: Finnish

Leikkaavuudet:

463054S Manufacturing Technology II 17.0 op

463054S-01 Manufacturing Technology II, examination 0.0 op

463054S-02 Manufacturing Technology II, exercises 0.0 op

ECTS Credits:

20 ects cr/530 hours of work

Language of instruction:

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

Timing:

Lectures, periods I and II. Exercises and seminar during periods I - IV.

Learning outcomes:

This course is the major subject for those who are majoring in Manufacturing Engineering. The aim of the course is to give the student the necessary knowledge for production management and for development of a manufacturing instrument. It also provides the student with the competence to choose the most economical equipment and machining methods.
After the course the student is capable of explaining the objectives and functions of production as well as production planningsystems and manufacturing systems. The student is able to explain the benefits of the flexible manufacturing system in small batch manufacturing.He/she is able to find competitive operation methods for different production cases. He/she is capable of evaluating machine tool structure knowledge and selecting productive manufacturing solutions. In addition, he/she is able to apply tool systems and machining methods of the different parts manufacturing. The students is also given a general view of electronics products and how they are manufactured. Upon completion of the course, a student should be able to recognize the special characteristics of electronics products on different assembly levels. He/she can explain the electronics components, manufacturing operations and assembly process requirements. He /she can also list and explain the essential factors affecting to quality and methods to ensure it.

Contents:

Production management; Production systems; Lean- and Just In Time production; Production automation; Construction and choice of machine tools; Fundamentals of tool design; The theory of cutting process; The theory of choosing economical cutting parameters. Electronics products; Components; Manufacturing process; Assembly process; Manufacturing systems and quality control.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 90 h are held in the fall during periods I and II. Laboratory and design exercises 410 h (150 h of guided teaching) will be done according to the project plan during the fall and spring semesters in groups of four. A seminar (30 h) attendance and presentation will be included in the course.

Target group:

Master's degree studies

Prerequisites and co-requisites:

463053A Manufacturing Technology I

Recommended or required reading:

The materials for this course include lecture notes and exercise materials. The material that is in English will be distributed at the lectures.

Assessment methods and criteria:

Three midterm exams or one final exam is required. Completing the exercises which need to be done, returned and accepted.

Grading:

Numerical grading scale 1-5. The final grade is based on the combined points from the exam (grade 0.5) and exercises (grade 0.5).

Person responsible:

University Teacher Heikki Pirkola

463106S: Design and manufacture of sheet and plate metal products, 8 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jyri Porter

Opintokohteen kielet: Finnish

Leikkaavuudet:

463066A	Introduction to Sheet Metal Design	3.5 op
463067A	Manufacturing Technology of Sheet Metal Products	3.5 op

ECTS Credits:

8 cr / 213 hours of work

Language of instruction:

Finnish, the course can be completed also in English.

Timing:

Organized in the spring semester. Lectures and seminar during period 3, practical work during period 4.

Learning outcomes:

The course introduces the student to the design and manufacture of sheet and plate metal products. After the course, the student can describe the designing and manufacturing processes of sheet and plate metal products. The student can design sheet and plate metal parts and the tools required. He/she can also utilize computer programs. The student can also take into account functional or manufacturing aspects of the parts.

Contents:

Features, possibilities and limitations of processes, equipment and systems used in design and manufacture of sheet and plate metal parts. Designing principles and methodology, computer-aided tools for designing sheet metal parts. Dimensioning principles, selection of materials, as well as the pros and cons of different manufacturing processes. Defects in manufacture and failure modes under static and dynamic loading. Characteristics of high strength and ultra high strength steels in sheet and plate metal products. Finally, the student can apply his/her knowledge to designing production-friendly sheet and plate metal products and assemblies.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

The course consists of lectures 40h, seminars 40h, demonstrations 10h, project work (in a group) 100h including independent studies, final exam 3h and preparation for the exam 20h. The project work topic is flexible and enables realization of student-initiated ideas.

Target group:

Mechanical engineering students in their Master's studies, 4th year.

Prerequisites and co-requisites:

Machine drawing and CAD, Computer aided design.

Recommended optional programme components:

Introduction to materials for mechanical engineering, Materials for mechanical engineering, Welding and heat treatment of metals.

Recommended or required reading:

Course notes (mainly in Finnish), contemporary articles. References: Boljanovic, V.: Sheet metal forming processes and die design, Industrial Press, Inc., New York, 2004, 219 p. Hosford, W. F. & Caddell, R. M.: Metal Forming - Mechanics and Metallurgy, 3rd Ed, Cambridge University Press, New York, 2007, 328 p SSAB: Design Handbook, 2012. SSAB: Sheet Steel Forming Handbook, 1997. SSAB:Welding Handbook. SSAB: Sheet Steel Joining Handbook, 2004. Schuler GmbH (Ed.): Metal forming handbook, Springer, Verlag, Berlin, 1998. 588 s.

Assessment methods and criteria:

Final exam. The final grade is based on the combined points from the exam (0.5), seminar and practical work (0.5).

Grading:

1 to 5, zero denotes failure to pass.

Person responsible:

Jyri Porter

Other information:

The course objective is to familiriaze students especially with methods for manufacturing parts used in mechanical engineering.

463109S: Computer aided manufacturing, 7 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jouko Heikkala

Opintokohteen kielet: Finnish

Leikkaavuudet:

463059S-01	Computer aided manufacturing, examination	0.0 op
463059S-02	Computer aided manufacturing, exercise work	0.0 op
463059S	Computer Aided Manufacturing	4.0 op

ECTS Credits:

7 ECTS

Language of instruction:

Finnish

Timing:

Lectures and exercises at period 2.

Learning outcomes:

The aim of the course is to introduce the students to the methods and systems used in Computer Aided Manufacturing (CAM) through lectures, demonstrations and personal exercises. After the course the student will be able to use computer-assisted methods and systems in connection with the various manufacturing processes of the workshops. The student is able to describe the main features, possibilities and limitations of methods and systems, as well as trends in the field. In addition, he / she can apply his / her knowledge to solve practical problems.

Contents:

Different areas of digital engineering and their interfaces. Computer aided programming and simulation of numerically controlled (NC) machine tools used in manufacturing and the various steps of generating and processing control data. Connection of machine tools to NC programming systems and manufacturing systems. Industrial robots and workshop automation. Analysis and software correction of machining errors.

Methods for measuring surface and shape. Methods of rapid preparation and their use. The exercises will introduce you to the areas of computer-aided manufacturing and apply the information to solve various practical problems.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures and assignments. There are three different CAM programs used for teaching: Dassault Systems Cat, Siemens NX and Autodesk Inventor.

Prerequisites and co-requisites:

463102A Production Technology I.

Recommended or required reading:

Materials given in lectures. News articles and web publications. Eero Pikkarainen - Mika Mustonen: Numeerisesti ohjatut työstökoneet; Timo Laakko: Tuotteen 3D-CAD-suunnittelu; Edu.fi; NC-tekniikka: http://www03.edu.fi/oppimateriaalit/nctekniikka/materiaali/

Assessment methods and criteria:

Final exam.The final grade is based on the combined points from the exam (grade 0.6) and exercises (grade 0.4).

Grading:

Numerical grading scale 1-5.

Person responsible:

Jouko Heikkala

462104A: Machine automation, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Louhisalmi, Yrjö Aulis

Opintokohteen kielet: Finnish

Leikkaavuudet:

462022S-01	Machine Automation II, examination	0.0 op
462022S-02	Machine Automation II, exercise work	0.0 op
462022S	Machine Automation II	5.0 op

ECTS Credits:

5 cr / 133 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the autumn semester, during periods 1 and 2. It is recommended to complete the course at the 3rd autumn semester.

Learning outcomes:

Upon completion of the course, the student will be able to explain the basic principles and structures of a typical machine automation system. The student is able to divide an automation system into basic elements and explain their role and significance in the system. The student can apply the basic digital technology and logic methods in designing a typical machine automation system. In addition to this, the student knows the operating principles of programmable logic controllers (PLCs) and is able to implement a logic control for a typical application. Furthermore, the student is able to explain the basic principles of fieldbuses. The students also knows the basics of machine automation safety design.

Contents:

Basics of automation; Basics of digital technology and logic; Description of operation sequences; Architecture of programmable logic controllers and their programming; Distributed systems and fieldbuses.

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

Lectures 32 h / Group work 16 h / Self-study 85 h

Target group:

Bachelor's degree students of mechanical engineering

Prerequisites and co-requisites:

The recommended prerequisite is the completion of the following courses prior to enrolling for the course: Actuators in Machine Automation, Elementary Programming

Recommended optional programme components:

The course is an independent entity and does not require additional studies carried out at the same time. However, it is recommended to complete the course Machine Sensor Technology simultaneously.

Recommended or required reading:

Lecture material. Other material is in the beginning of the course.

Assessment methods and criteria:

This course utilizes continuous assessment. The assessment can be based on learning diary, homework, exercises, seminars and exam.

Grading:

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

Person responsible:

University teacher Yrjö Louhisalmi

460004S: Practical Training II, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Practical training
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Reijo Saari
Opintokohteen kielet: Finnish
Leikkaavuudet:

485002S	Advanced Practical Training	5.0 op
460002S	Practical Training II	3.0 op

Ei opintojaksokuvauksia.

A460246: Supplementary Module, Automotive Engineering, 20 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Supplementary Module
Laji: Study module
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

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462109S: Simulation and modelling of machines, 8 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Liedes, Toni Mikael

Opintokohteen kielet: Finnish

Leikkaavuudet:

462055S-01	Virtual Engineering of Mechatronic Products, examination	0.0 op
462055S-02	Virtual Engineering of Mechatronic Products, exercise work	0.0 op
462055S	Virtual Engineering of Mechatronic Products	5.0 op

ECTS Credits:

8 cr / 213 hours of work

Language of instruction:

Finnish

Timing:

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

Learning outcomes:

Upon completion of the course, the student will be able to create a simulation model consisting of rigid bodies using Adams and MATLAB/Simulink software. The student is able to interpret the simulation results and is also able to evaluate the validity of the results. The student is able to design submodels of complex systems and he/she is able to explain the principles of creating a more complex simulation model. In addition to this, the student is able to evaluate the extent of modelling process of various kinds of engineering systems.

Contents:

Basics of virtual design; ADAMS simulation software principles and basic usage; Creation and usage of multibody systems comprised of rigid bodies; Kinematic and dynamic analysis; Determination of actuator motion paths and velocities as well as determination of loads; Modelling and simulation of control systems.

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

Lectures 32 h / Group work 32 h / Self-study 149 h

Target group:

Master's degree students of mechanical engineering

Prerequisites and co-requisites:

The recommended prerequisite is the completion of the following courses prior to enrolling for the course.

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 handout. Other material is in the beginning of the course.

Assessment methods and criteria:

This course utilizes continuous assessment. The assessment can be based on learning diary, exercises, seminars and exam. The more detailed assessment criteria are available on the Noppa Study Portal.

Grading:

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

Person responsible:

Lecturer Toni Liedes

463105A: Casting techniques, 8 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Jouko Heikkala
Opintokohteen kielet: Finnish
Leikkaavuudet:

463065A-01	Manufacturing of plastic products, examination	0.0 op
463065A-02	Manufacturing of plastic products, exercise work	0.0 op
463058A-01	Foundry Technology, examination	0.0 op
463058A-02	Foundry Technology, exercises	0.0 op
463058A-03	Foundry technology, laboratory exercise	0.0 op
463058A	Foundry Technology	3.5 op
463065A	Manufacturing of Plastics Products	3.5 op

ECTS Credits:

8 ECTS

Language of instruction:

Finnish

Timing:

The course is scheduled for the autumn semester, 1st and 2nd period.

Learning outcomes:

The aim of the course is to give the students basic information concerning casting processes in manufacturing and how they are applied to different kinds of production and materials and also what those methods require for product design. After completing the course the student can estimate which kinds of products are possible and profitable to make by casting. The student can name the main principles of common casting methods and how those methods suit to different kinds of products, materials and various sizes. The student knows the most common metallic and plastic materials and the suitable casting methods for those. The student can also explain the main steps of the process plan and casting system design.

Contents:

Different types of patterns and moulds. Molding, casting and melting methods. Cast metals and plastics. Parts post-processing. Design of cast part and process. Main types, properties and use of technical plastics. Injection molding and special applications. Other plastic part manufacturing methods. Design of cast product. Tool and die design and manufacturing. The use of computer-aided design tools and additive manufacturing.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures and exercises, examination.

Target group:

Students of the Bachelor stage of the Mechanical Engineering Degree Programme.

Recommended or required reading:

Lectures; News articles and web pages (given in lectures). Autere, Ingman, Tennilä: Valimotekniikka I ja II; Ihalainen-Aaltonen-Aromäki-Sihvonen: Valmistustekniikka. Valutekniikka, s. 59-88
Valuatlas: https://www.valuatlas.fi/

Virtuaaliyliopisto; Muoviteknologia: http://www.uiah.fi/virtu/materiaalit/muoviteknologia/ Muoviteollisuus ry: http://www.muoviteollisuus.fi/opetusmateriaalit/muovien_ihmeellinen_maailma/ Muovinetti: https://muovinetti.com/hyva-tietaa-muovista/ Suomen valimotekninen yhdistys: http://www.svy.info/

Assessment methods and criteria:

Examination and exercises are graded 1-5. The final grade is determined 30% by the exercises and 70% by the examination.

Grading:

Numerical grading scale 1-5.

Person responsible:

Jouko Heikkala

463104A: Advanced manufacturing methods, 7 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jyri Porter

Opintokohteen kielet: Finnish

Leikkaavuudet:

463068S-01	Laser Processing, examination	0.0 op
463068S-02	Laser Processing, exercises and seminari	0.0 op
463068S	Laser Processing	3.5 op

ECTS Credits:

7 cr / 187 hours of work

Language of instruction:

Finnish, the course can also be completed in English

Timing:

Organized during the autumn semester. Lectures and seminar during period 1, demonstrations and practical work during period 2.

Learning outcomes:

The student can apply laser machining processes, electrical discharge machining, abrasive water jet cutting and additive manufacturing processes in today's machine shops as well as choose suitable equipment for various applications. The student can also describe the main features, capabilities, limitations and trends of the aforementioned processes.

Contents:

Classes and seminars deal with the fundamentals and equipment of laser material processing, electrical discharge machining, abrasive water jet cutting and additive manufacturing processes. Other processes may be added as deemed suitable. Material interaction, process and equipment possibilities and limitations. Additionally, safety and health aspects of the processes are covered.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

The course consists of lectures and seminars 46h, preparation for the seminars 34h, demonstrations 10h, practical work as a group project 70h, final exam 3h and preparation for the exam 24h. The project work is flexible and enables realization of student-initiated project ideas.

Target group:

Mechanical engineering students in their Bachelor's studies, 3rd year.

Recommended optional programme components:

Production technology studies in general.

Recommended or required reading:

Course notes (mainly in Finnish), contemporary articles. References: Ion, J.C. Laser Processing of Engineering Material, Elsevier 2005. Steen, W.K. Laser Material Processing, Springer 2003.

Assessment methods and criteria:

Final exam. The final grade is based on the combined points from the exam (0.4), seminar and practical work (0.6).

Grading:

1 to 5, zero denotes failure to pass.

Person responsible:

Jyri Porter

Other information:

The course objective is to familiriaze students especially with methods for manufacturing parts used in mechanical engineering. Methods covered in the course are alternative or supplementary to traditional manufacturing methods.

463108S: Manufacturing technology II, 10 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Niskanen, Jari Ensio, Jyri Porter, Pirkola, Heikki Juhani

Opintokohteen kielet: Finnish

Leikkaavuudet:

463055S-01	Manufacturing Technology II, examination	0.0 op
463055S-02	Manufacturing technology II, seminar	0.0 op
463055S	Manufacturing Technology II	5.0 op

ECTS Credits:

10 ects cr/ 270 hours of work

Language of instruction:

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

Timing:

Lectures during periods I and II. Lectures together the course 463107S Manufacturing Technology II. Seminar on period II.

Learning outcomes:

This course is the major subject for those who are majoring in Manufacturing Engineering. The aim of the course is to give the student the necessary knowledge for production management and for development of a manufacturing instrument. It also provides the student with the competence to choose the most economical equipment and machining methods.
After the course the student is capable of explaining the objectives and functions of production as well as production planningsystems and manufacturing systems. The student is able to explain the benefits of the flexible manufacturing system in small batch manufacturing.He/she is able to find competitive operation methods for different production cases. He/she is capable of evaluating machine tool structure knowledge and selecting productive manufacturing solutions. In addition, he/she is able to apply tool systems and machining methods of the different parts manufacturing. The students is also given a general view of electronics products and how they are manufactured. Upon completion of the course, a student should be able to recognize the special characteristics of electronics products on different assembly levels. He/she can explain the electronics components, manufacturing operations and assembly process requirements. He /she can also list and explain the essential factors affecting to quality and methods to ensure it.

Contents:

Production management; Production systems; Lean- and Just In Time production; Production automation; Construction and choice of machine tools; Fundamentals of tool design; The theory of cutting process; The theory of choosing economical cutting parameters. Electronics products; Components; Manufacturing process; Assembly process; Manufacturing systems and quality control.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 90 h are held in the fall during periods I and II. A seminar (30 h) attendance and presentation will be included in the course during the fall semester.

Target group:

Master's degree studies

Prerequisites and co-requisites:

463102A Manufacturing Technology I

Recommended or required reading:

The materials for this course include lecture notes and exercise materials. The material that is in English will be distributed at the lectures.

Assessment methods and criteria:

Three midterm exams or one final exam is required and the seminar needs to be accepted.

Grading:

Numerical grading scale 1-5.

Person responsible:

University Teacher Heikki Pirkola

463106S: Design and manufacture of sheet and plate metal products, 8 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jyri Porter

Opintokohteen kielet: Finnish

Leikkaavuudet:

463066A	Introduction to Sheet Metal Design	3.5 op
463067A	Manufacturing Technology of Sheet Metal Products	3.5 op

ECTS Credits:

8 cr / 213 hours of work

Language of instruction:

Finnish, the course can be completed also in English.

Timing:

Organized in the spring semester. Lectures and seminar during period 3, practical work during period 4.

Learning outcomes:

The course introduces the student to the design and manufacture of sheet and plate metal products. After the course, the student can describe the designing and manufacturing processes of sheet and plate metal products. The student can design sheet and plate metal parts and the tools required. He/she can also utilize computer programs. The student can also take into account functional or manufacturing aspects of the parts.

Contents:

Features, possibilities and limitations of processes, equipment and systems used in design and manufacture of sheet and plate metal parts. Designing principles and methodology, computer-aided tools for designing sheet metal parts. Dimensioning principles, selection of materials, as well as the pros and

cons of different manufacturing processes. Defects in manufacture and failure modes under static and dynamic loading. Characteristics of high strength and ultra high strength steels in sheet and plate metal products. Finally, the student can apply his/her knowledge to designing production-friendly sheet and plate metal products and assemblies.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

The course consists of lectures 40h, seminars 40h, demonstrations 10h, project work (in a group) 100h including independent studies, final exam 3h and preparation for the exam 20h. The project work topic is flexible and enables realization of student-initiated ideas.

Target group:

Mechanical engineering students in their Master's studies, 4th year.

Prerequisites and co-requisites:

Machine drawing and CAD, Computer aided design.

Recommended optional programme components:

Introduction to materials for mechanical engineering, Materials for mechanical engineering, Welding and heat treatment of metals.

Recommended or required reading:

Course notes (mainly in Finnish), contemporary articles. References: Boljanovic, V.: Sheet metal forming processes and die design, Industrial Press, Inc., New York, 2004, 219 p. Hosford, W. F. & Caddell, R. M.: Metal Forming - Mechanics and Metallurgy, 3rd Ed, Cambridge University Press, New York, 2007, 328 p SSAB: Design Handbook, 2012. SSAB: Sheet Steel Forming Handbook, 1997. SSAB:Welding Handbook. SSAB: Sheet Steel Joining Handbook, 2004. Schuler GmbH (Ed.): Metal forming handbook, Springer, Verlag, Berlin, 1998. 588 s.

Assessment methods and criteria:

Final exam. The final grade is based on the combined points from the exam (0.5), seminar and practical work (0.5).

Grading:

1 to 5, zero denotes failure to pass.

Person responsible:

Jyri Porter

Other information:

The course objective is to familiriaze students especially with methods for manufacturing parts used in mechanical engineering.

465113S: Failure mechanisms in metals, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Nousiainen, Olli Pekka

Opintokohteen kielet: Finnish

Leikkaavuudet:

465079S	Failure Analysis	3.5 op

ECTS Credits:

5 ECTS/135 h study time

Language of instruction:

Finnish

Timing:

Spring semester, period 4. Recommended for fourth year of studies.

Learning outcomes:

After completion of the course, the student will be able to explain the effects of mechanical and environmental loads on the possible failure mechanisms in alloys. (S)he will be able to avoid unsuitable choices of materials in various applications. (S)he will be able to list the stages involved in a typical failure analysis. The student will be able to determine the most likely failure mechanism on the basis of the macroscopic and microscopic features of fracture surfaces. (S)he will be able to give rational instructions for avoiding failures.

Contents:

Failure mechanisms at low and high temperatures under static and dynamic loading. Failures caused by corrosion. Macroscopic and microscopic features of fracture surfaces. General principles and approaches to failure analysis. Failures induced by hydrogen. Practical examples of failure cases.

Mode of delivery:

Face to face

Learning activities and teaching methods:

Lectures 32 h / independent study 103 h.

Target group:

Compulsory in the masters stage for all Mechanical Engineering students majoring in Materials Engineering.

Prerequisites and co-requisites:

Before registering for this course the student must have successfully completed the following courses: 465101A An Introduction to Materials for Mechanical Engineering, 465102A Materials for Mechanical Engineering, 465105A Research techniques for materials, and 465107A An Introduction to Physical Metallurgy.

Recommended or required reading:

Study guide and lecture slides. Additional material: Wulpi, D.J.: Understanding How Components Fail, ASM 1985. Engel L. and Klingele H.: Atlas of Metals Damage, Carl Hauser Verlag.

Assessment methods and criteria:

Final grade assessed on the basis of final examination.

Grading:

Pass grades on a scale of 1-5. Grade 0 fail.

Person responsible:

Olli Nousiainen

461108A: Mechanics of materials, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Koivurova Hannu

Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS credits / 90 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the Autumn semester, during periods 1 and 2. It is recommended to complete the course at the 3rd autumn semester.

Learning outcomes:

Upon completing the required coursework, the student knows the theoretical background of the strength of materials and he/she is able to apply the theory of the strength of materials to different kind of design problems needed in engineering mechanics. He/she understand the fundamental concepts of mechanics of deformable solids; including static equilibrium, geometry of deformation, and material constitutive behavior. He/she can discuss the basic mechanical principles underlying modern approaches for modelling of various types of materials under a different type of loadings. This provide students with exposure to the systematic methods for solving engineering problems in solid mechanics. He/she can also build the necessary theoretical background for further structural analysis and design courses.

Contents:

The general equations of mechanics. The stress and strain state. Different material models; Linear elastic material, isotropic, transverse-isotropic and orthotropic material models. The concept of strain energy. Theory of plasticity. Yield criterion, plastic flow rule and hardening. Limit state design. Introduction to visco elastic material and creep teory.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 30 h / Exercise 30 h / Self-study 30 h.

Target group:

Students of the Bachelor Stage of the Mechanical Engineering Degree Programme

Prerequisites and co-requisites:

Recommended: Strength of Materials I and II and the knowledge of vector and matrix calculations.

Recommended optional programme components:

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

Recommended or required reading:

Salmi, T., Virtanen, S. (2008) Materiaalien Mekaniikka. Pressus Oy.

Assessment methods and criteria:

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

Grading:

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

Person responsible:

University Lecturer Hannu Koivurova

461109A: Finite element methods II, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Lumijärvi, Jouko Veikko Juhani

Opintokohteen kielet: Finnish

Leikkaavuudet:

461034A	Finite Element Methods II	3.5 op
461034A-01	Finite Element Methods II, examination	0.0 op
461034A-02	Finite Element Methods II, exercises	0.0 op

ECTS Credits:

5 ECTS credits / 132 hours of work

Language of instruction:

Finnish

Timing:

Lectures and exercises, periods 3.-4.

Learning outcomes:

The aim of this course is for students to gain an understanding of the basic idea and restrictions of FEM in dynamic and buckling analyses and the preparedness to use commercial FE-programs.
After this course, the student can explain the basic idea of the FEM in the case of two- and three dimensional, geometrically complicated structures. In addition to the linear displacement and heat transfer problems, he/she is able to critically utilize the ready to use FEM-programs in the analysis of buckling-, modal- and dynamic problems. Also, the student knows the basic types of nonlinearity and recognizes their effect on the computations.

Contents:

Shell and solid elements. Buckling and modal analyses. Dynamic analyses. An introduction to the nonlinearities.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures and exercises take place during periods 3.-4. The course can be passed by completing a final exam.

Target group:

Degree Programme in Mechanical Engineering students.

Prerequisites and co-requisites:

Strength of Materials I and II, Finite Element Methods I.

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. NAFEMS: A Finite Element Dynamics Primer, NAFEMS: Introduction to Nonlinear Finite Element Analysis.

Assessment methods and criteria:

The grade of the course is based on a final exam. The student must pass the exercises before taking the examination.

Grading:

Numerical grading scale 1-5.

Person responsible:

Jouko Lumijärvi

461113S: Finite element methods III, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Lumijärvi, Jouko Veikko Juhani

Opintokohteen kielet: Finnish

Leikkaavuudet:

461020S-01	Advanced Course in Finite Element Methods, examination	0.0 op
461020S-02	Advanced Course in Finite Element Methods, exercises	0.0 op
461020S	Advanced Course in Finite Element Methods	5.0 op

ECTS Credits:

5 ECTS credits / 132 hours of work

Language of instruction:

Finnish

Timing:

Lectures and exercises, periods 1.-2.

Learning outcomes:

The aim of the course is to give students an enhanced understanding of the finite element method and to familiarize students with the analysis of non-linear problems.
Learning outcomes: Upon completion of this course, the student is able to apply the finite element method in analyzing the most important non-linear phenomena in engineering mechanics. He/she is able to choose suitable modeling and solution methods for different phenomena

Contents:

Static and dynamic non-linear phenomena in engineering mechanics: Geometric nonlinearity, buckling, contact problems and non-linear material models.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures and exercises take place during periods 1.-3. The course can be passed by a final exam.

Prerequisites and co-requisites:

Finite Element Methods I, Finite Element Methods II.

Recommended or required reading:

Lecture notes (in Finnish), Belytschko, T., Liu, W. K., Moran, B.: Finite Elements for Nonlinear Continua and Structures, John Wiley & Sons Ltd., 2000, Bathe, K.-J.: Finite Element Procedures, Prentice-Hall, 1996, Hinton, E.: NAFEMS Introduction to Nonlinear Finite Element Analysis, Bell and Bain Ltd., 1992.

Assessment methods and criteria:

The grade of the course is based on a final exam. The student must pass the exercises before taking the examination.

Grading:

Numerical grading scale 1-5.

Person responsible:

Jouko Lumijärvi

464108S: Advanced Topics on Machine Design, 5 - 10 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Niskanen, Juhani
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

555343S: Product Data and product life cycle management, 5 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Erno Mustonen
Opintokohteen kielet: English

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Period 3-4.

Learning outcomes:

The course familiarises students with the broad concepts of product data management (PDM) and product life cycle management (PLM). Upon completion of the course, the student will be able to:

- understand the basic terminology related to product, productisation, PDM and PLM
- analyse the current status of the productisation, product data structures, product life cycle management, commercial and technical product portfolios and related applications in case companies
- create strategic PDM and PLM concept based on the critical building blocks for one product data, product master data and product related business data
- model the company's HW, SW and Service product related commercial and technical product portfolios according to productisation concept
- understand the PDM and PLM processes including key roles such as concept owners, education and support roles, data owners, data users including the product data quality concept
- create and implement the governance model for PDM and PLM process and IT development as a part of company's business process development including PDM/PLM related information technology (IT) architecture for product master data and product related business data

Contents:

PDM and PLM strategic targets, productisation concept, commercial and technical product portfolios, PDM and PLM processes and tools, governance model and related IT applications and architecture

Mode of delivery:

The tuition will be implemented as face-to-face teaching, course readings and by a practical assignment which is a common with a course 555346S Product portfolio management.

Learning activities and teaching methods:

Face-to-face teaching 20 h (lectures), practical assignment (group work) and self-study 114 h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

555242 Product development

Recommended optional programme components:

555350S Research and technology management, 555351S Advanced course in product development, 555346S Product portfolio management

Recommended or required reading:

Lecture materials and selected articles.

Assessment methods and criteria:

Group work report (50 % of the grade) and exam (50 % of the grade).

Grading:

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

Person responsible:

D. Sc. Erno Mustonen

Working life cooperation:

The group work will be done in cooperation with case companies.

Other information:

Previous course name was 'Product Data Management'.

462111S: Machine diagnostics, 10 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jouni Laurila

Opintokohteen kielet: Finnish

Leikkaavuudet:

464088S	Diagnosis of Machine Condition	8.0 op
464088S-01	Diagnosis of Machine Condition, examination	0.0 op
464088S-02	Diagnosis of Machine Condition, exercises	0.0 op

ECTS Credits:

10 ECTS credits / 270 hours of work

Language of instruction:

Finnish

Timing:

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

Learning outcomes:

After completing the course the student will be able to use various methods of machine diagnostics and use the most common measuring devices to determine the functioning and condition of machines. He / she is able to apply the key indicators and signal processing methods used in condition monitoring and to analyze the frequency content of signals in order to solve problems related to the operation of machines. They will be able to draw up a measurement plan, make measurements, analyze the data obtained and report the results obtained. He / she is also able to evaluate what factors affect the reliability and comparability of measurements. The student is able to use industry standards to help evaluate the condition of machinery and the vibration intensity. They will be able to understand the importance of machine diagnostics in the success and productivity of maintenance.

Contents:

Major methods and measurement techniques used in machine diagnostics, machine vibration analysis and fault detection, key signal processing methods, measurement design, implementation and reporting, machine balancing, industry standards.

Mode of delivery:

Face-to-face teaching

Target group:

Master's degree students in the mechanical engineering

Prerequisites and co-requisites:

The recommended prequisite is the completion of the following course: 462107A Maintenance of Machines, 462105A Sensor technology for Machines.

Recommended optional programme components:

The course is an independent entity.

Recommended or required reading:

Lecture handout and the other material delivered during the course. Supplementary readings: Mills, S.R. W., Vibration Monitoring & Analysis Handbook, BINDT, 2010. Mikkonen, H. (toim.), Kuntoon perustuva kunnossapito, KP-Media Oy, 2009. PSK-käsikirja 3: Kunnonvalvonnan värähtelymittaus, PSK Standardisointiyhdistys ry, 2019.

Assessment methods and criteria:

Final examination and the other graded assignments

Grading:

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

Person responsible:

Jouni Laurila

462112S: Measuring instruments in machine diagnostics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Konsta Antero Karioja

Opintokohteen kielet: Finnish

Leikkaavuudet:

464089S-01 Measuring Instrumentation and Techniques for Diagnosis of Machine Condition, examination 0.0 op

464089S-02 Measuring Instrumentation and Techniques for Diagnosis of Machine Condition, exercises 0.0 op

464089S Measuring Instrumentation and Techniques for Diagnosis of Machine Condition 5.0 op

ECTS Credits:

5 ECTS credits / 135 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the autumn semester, during period 1 and 2. It is recommended to complete the course at the 5th autumn semester.

Learning outcomes:

After completing the course, the student will be able to design, construct and calibrate the various measurement chains needed in machine diagnostics. They are able to use data loggers, analyzers, PC-based measurement systems, data acquisition cards and various filters, and other typical measuring instruments and know how they work, which is central to test diagnostics. The student also identifies the most important sources of error that affect the reliability and comparability of measurement results.

Contents:

Sensors and instrumentation for machine diagnostics, other equipment, design of measurement systems, evaluation and calibration of performance, and main signal processing methods in machine diagnostics.

Mode of delivery:

Face-to-face teaching

Target group:

Master's degree students in the mechanical engineering

Prerequisites and co-requisites:

The recommended prequisite is the completion of the following courses: 462105A Sensor technology for machines, 462107A Maintenance of Machines and 462111S Machine Diagnostics.

Recommended optional programme components:

The course is an independent entity.

Recommended or required reading:

Lecture handout and the other material delivered during the course. Supplementary readings: Mills, S.R. W., Vibration Monitoring & Analysis Handbook, BINDT, 2010. Mikkonen, H. (toim.), Kuntoon perustuva kunnossapito, KP-Media Oy, 2009. PSK-käsikirja 3 – Kunnonvalvonnan värähtelymittaus, PSK Standardisointiyhdistys ry, 2012.

Assessment methods and criteria:

Final examination and the other graded assignments

Grading:

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

Person responsible:

Konsta Karioja

464105S: Computer aided design, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

Leikkaavuudet:

462044S-01	Computer Aided Design, examination	0.0 op
462044S-02	Computer Aided Design, exercise work	0.0 op
462044S	Computer Aided Design	3.5 op

ECTS Credits:

5 ects / 133 hours of studying work.

Language of instruction:

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

Timing:

Lectures and exercises arranged spring during periods 3. Recommended date of performance 4th year spring.

Learning outcomes:

After completing the course, the student will know modern CAD/CAE tools, simulation and virtual validation possibilities with CAD/CAE systems. The best procedures in various design tasks have also become familiar. In addition, the student is familiar with the theory behind CAD systems related to the geometry of models and their modification. In addition, the student also has a basis for product information management and the use of design data in PDM/PLM systems.

Contents:

The course includes product design and product validation on a computer-aided basis. During the course, you will get acquainted with the possibilities of product design and validation of functionality using CAD /CAE systems. Use of the computer in design functions and the applicable systems. Parametricity and customizability of the product play an important role. In addition,students learn what special tools design software offers.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 20 h/ exercises 30 h/ practical assignment 83 h. Exercises are carried out independently and the assignment in small groups.

Target group:

Master's Degree student of mechanical engineering, specially students studying Machine Design.

Prerequisites and co-requisites:

Machine Drawing and CAD, Design of Machine Elements.

Recommended optional programme components:

The course is an independent entity and does not require other studies to be completed at the same time.

Recommended or required reading:

e-Design Computer-Aided Engineering Design (Chang K-H., Elsevier, 2015)
In addition: Lee, K. Principles of CAD/CAM/CAE Systems, Addison-Wesley, Inc.: New York, 1999, 581 s.

Assessment methods and criteria:

Final exam, lecture exercises and exercise work. For the final grade, the exam has a weight factor of 0.4; for lecture exercises, 0.2; and for exercise work, 0.4.

Grading:

Numerical grading scale 1-5 / fail

Person responsible:

Jussi Salakka

462105A: Machine Sensor Technology, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Liedes, Toni Mikael

Opintokohteen kielet: Finnish

Leikkaavuudet:

462053A Sensor Technology of Machine Automation 5.0 op

ECTS Credits:

5 cr / 133 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the autumn semester, during periods 1 and 2. It is recommended to complete the course at the 3rd autumn semester.

Learning outcomes:

Upon completion of the course, the student will be able identify, classify and bring into use the most common sensor types used in machine automation. The student is able to choose sensors for typical automation applications. In addition to this, the student is able to design a common analog and digital signal transmission and conditioning chain.

Contents:

Basics measuring systems; Classification of sensors; Characteristics of analog and digital domain; Analog to digital conversion; Basics of analog signal conditioning: amplification, attenuation and filtering; Operating principle of digital sensors; Examples of typical sensors used in mechanical engineering and civil engineering;

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

Lectures 32 h / Group work 16 h / Self-study 85 h

Target group:

Bachelor's degree students of mechanical engineering

Prerequisites and co-requisites:

The recommended prerequisite is the completion of the following courses prior to enrolling for the course: Actuators in Machine Automation

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:

de Silva, Clarence W. Mechatronics: An Integrated Approach. CRC Press, 2005, 1312 p. Chapters 4-7; Lecture notes.

Assessment methods and criteria:

This course utilizes continuous assessment. The assessment can be based on learning diary, exercises, seminars and exam.

Grading:

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

Person responsible:

Lecturer Toni Liedes

A460247: Supplementary Module, Machine Design, 22 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Supplementary Module
Laji: Study module
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

en

462109S: Simulation and modelling of machines, 8 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Liedes, Toni Mikael
Opintokohteen kielet: Finnish
Leikkaavuudet:

462055S-01	Virtual Engineering of Mechatronic Products, examination	0.0 op
462055S-02	Virtual Engineering of Mechatronic Products, exercise work	0.0 op
462055S	Virtual Engineering of Mechatronic Products	5.0 op

ECTS Credits:

8 cr / 213 hours of work

Language of instruction:

Finnish

Timing:

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

Learning outcomes:

Upon completion of the course, the student will be able to create a simulation model consisting of rigid bodies using Adams and MATLAB/Simulink software. The student is able to interpret the simulation results and is also able to evaluate the validity of the results. The student is able to design submodels of complex systems and he/she is able to explain the principles of creating a more complex simulation model. In addition to this, the student is able to evaluate the extent of modelling process of various kinds of engineering systems.

Contents:

Basics of virtual design; ADAMS simulation software principles and basic usage; Creation and usage of multibody systems comprised of rigid bodies; Kinematic and dynamic analysis; Determination of actuator motion paths and velocities as well as determination of loads; Modelling and simulation of control systems.

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

Lectures 32 h / Group work 32 h / Self-study 149 h

Target group:

Master's degree students of mechanical engineering

Prerequisites and co-requisites:

The recommended prerequisite is the completion of the following courses prior to enrolling for the course.

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 handout. Other material is in the beginning of the course.

Assessment methods and criteria:

This course utilizes continuous assessment. The assessment can be based on learning diary, exercises, seminars and exam. The more detailed assessment criteria are available on the Noppa Study Portal.

Grading:

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

Person responsible:

Lecturer Toni Liedes

463104A: Advanced manufacturing methods, 7 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jyri Porter

Opintokohteen kielet: Finnish

Leikkaavuudet:

463068S-01	Laser Processing, examination	0.0 op
463068S-02	Laser Processing, exercises and seminari	0.0 op
463068S	Laser Processing	3.5 op

ECTS Credits:

7 cr / 187 hours of work

Language of instruction:

Finnish, the course can also be completed in English

Timing:

Organized during the autumn semester. Lectures and seminar during period 1, demonstrations and practical work during period 2.

Learning outcomes:

The student can apply laser machining processes, electrical discharge machining, abrasive water jet cutting and additive manufacturing processes in today's machine shops as well as choose suitable equipment for various applications. The student can also describe the main features, capabilities, limitations and trends of the aforementioned processes.

Contents:

Classes and seminars deal with the fundamentals and equipment of laser material processing, electrical discharge machining, abrasive water jet cutting and additive manufacturing processes. Other processes may be added as deemed suitable. Material interaction, process and equipment possibilities and limitations. Additionally, safety and health aspects of the processes are covered.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

The course consists of lectures and seminars 46h, preparation for the seminars 34h, demonstrations 10h, practical work as a group project 70h, final exam 3h and preparation for the exam 24h. The project work is flexible and enables realization of student-initiated project ideas.

Target group:

Mechanical engineering students in their Bachelor's studies, 3rd year.

Recommended optional programme components:

Production technology studies in general.

Recommended or required reading:

Course notes (mainly in Finnish), contemporary articles. References: Ion, J.C. Laser Processing of Engineering Material, Elsevier 2005. Steen, W.K. Laser Material Processing, Springer 2003.

Assessment methods and criteria:

Final exam. The final grade is based on the combined points from the exam (0.4), seminar and practical work (0.6).

Grading:

1 to 5, zero denotes failure to pass.

Person responsible:

Jyri Porter

Other information:

The course objective is to familiriaze students especially with methods for manufacturing parts used in mechanical engineering. Methods covered in the course are alternative or supplementary to traditional manufacturing methods.

463105A: Casting techniques, 8 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jouko Heikkala

Opintokohteen kielet: Finnish

Leikkaavuudet:

463065A-01	Manufacturing of plastic products, examination	0.0 op
463065A-02	Manufacturing of plastic products, exercise work	0.0 op
463058A-01	Foundry Technology, examination	0.0 op
463058A-02	Foundry Technology, exercises	0.0 op
463058A-03	Foundry technology, laboratory exercise	0.0 op
463058A	Foundry Technology	3.5 op
463065A	Manufacturing of Plastics Products	3.5 op

ECTS Credits:

8 ECTS

Language of instruction:

Finnish

Timing:

The course is scheduled for the autumn semester, 1st and 2nd period.

Learning outcomes:

The aim of the course is to give the students basic information concerning casting processes in manufacturing and how they are applied to different kinds of production and materials and also what those methods require for product design. After completing the course the student can estimate which kinds of products are possible and profitable to make by casting. The student can name the main principles of common casting methods and how those methods suit to different kinds of products, materials and various sizes. The student knows the most common metallic and plastic materials and the suitable casting methods for those. The student can also explain the main steps of the process plan and casting system design.

Contents:

Different types of patterns and moulds. Molding, casting and melting methods. Cast metals and plastics. Parts post-processing. Design of cast part and process. Main types, properties and use of technical plastics. Injection molding and special applications. Other plastic part manufacturing methods. Design of cast product. Tool and die design and manufacturing. The use of computer-aided design tools and additive manufacturing.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures and exercises, examination.

Target group:

Students of the Bachelor stage of the Mechanical Engineering Degree Programme.

Recommended or required reading:

Lectures; News articles and web pages (given in lectures). Autere, Ingman, Tennilä: Valimotekniikka I ja II; Ihalainen-Aaltonen-Aromäki-Sihvonen: Valmistustekniikka. Valutekniikka, s. 59-88
Valuatlas: https://www.valuatlas.fi/
Virtuaaliyliopisto; Muoviteknologia: http://www.uiah.fi/virtu/materiaalit/muoviteknologia/
Muoviteollisuus ry: http://www.muoviteollisuus.fi/opetusmateriaalit/muovien_ihmeellinen_maailma/ Muovinetti: https://muovinetti.com/hyva-tietaa-muovista/
Suomen valimotekninen yhdistys: http://www.svy.info/

Assessment methods and criteria:

Examination and exercises are graded 1-5. The final grade is determined 30% by the exercises and 70% by the examination.

Grading:

Numerical grading scale 1-5.

Person responsible:

Jouko Heikkala

463108S: Manufacturing technology II, 10 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Niskanen, Jari Ensio, Jyri Porter, Pirkola, Heikki Juhani
Opintokohteen kielet: Finnish
Leikkaavuudet:

463055S-01	Manufacturing Technology II, examination	0.0 op
463055S-02	Manufacturing technology II, seminar	0.0 op
463055S	Manufacturing Technology II	5.0 op

ECTS Credits:

10 ects cr/ 270 hours of work

Language of instruction:

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

Timing:

Lectures during periods I and II. Lectures together the course 463107S Manufacturing Technology II. Seminar on period II.

Learning outcomes:

This course is the major subject for those who are majoring in Manufacturing Engineering. The aim of the course is to give the student the necessary knowledge for production management and for development of a manufacturing instrument. It also provides the student with the competence to choose the most economical equipment and machining methods.
After the course the student is capable of explaining the objectives and functions of production as well as production planningsystems and manufacturing systems. The student is able to explain the benefits of the flexible manufacturing system in small batch manufacturing.He/she is able to find competitive operation methods for different production cases. He/she is capable of evaluating machine tool structure knowledge and selecting productive manufacturing solutions. In addition, he/she is able to apply tool systems and machining methods of the different parts manufacturing. The students is also given a general view of electronics products and how they are manufactured. Upon completion of the course, a student should be able to recognize the special characteristics of electronics products on different assembly levels. He/she can explain the electronics components, manufacturing operations and assembly process requirements. He /she can also list and explain the essential factors affecting to quality and methods to ensure it.

Contents:

Production management; Production systems; Lean- and Just In Time production; Production automation; Construction and choice of machine tools; Fundamentals of tool design; The theory of cutting process; The theory of choosing economical cutting parameters. Electronics products; Components; Manufacturing process; Assembly process; Manufacturing systems and quality control.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 90 h are held in the fall during periods I and II. A seminar (30 h) attendance and presentation will be included in the course during the fall semester.

Target group:

Master's degree studies

Prerequisites and co-requisites:

463102A Manufacturing Technology I

Recommended or required reading:

The materials for this course include lecture notes and exercise materials. The material that is in English will be distributed at the lectures.

Assessment methods and criteria:

Three midterm exams or one final exam is required and the seminar needs to be accepted.

Grading:

Numerical grading scale 1-5.

Person responsible:

University Teacher Heikki Pirkola

463106S: Design and manufacture of sheet and plate metal products, 8 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jyri Porter

Opintokohteen kielet: Finnish

Leikkaavuudet:

463066A	Introduction to Sheet Metal Design	3.5 op
463067A	Manufacturing Technology of Sheet Metal Products	3.5 op

ECTS Credits:

8 cr / 213 hours of work

Language of instruction:

Finnish, the course can be completed also in English.

Timing:

Organized in the spring semester. Lectures and seminar during period 3, practical work during period 4.

Learning outcomes:

The course introduces the student to the design and manufacture of sheet and plate metal products. After the course, the student can describe the designing and manufacturing processes of sheet and plate metal products. The student can design sheet and plate metal parts and the tools required. He/she can also utilize computer programs. The student can also take into account functional or manufacturing aspects of the parts.

Contents:

Features, possibilities and limitations of processes, equipment and systems used in design and manufacture of sheet and plate metal parts. Designing principles and methodology, computer-aided tools for designing sheet metal parts. Dimensioning principles, selection of materials, as well as the pros and cons of different manufacturing processes. Defects in manufacture and failure modes under static and dynamic loading. Characteristics of high strength and ultra high strength steels in sheet and plate metal products. Finally, the student can apply his/her knowledge to designing production-friendly sheet and plate metal products and assemblies.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

The course consists of lectures 40h, seminars 40h, demonstrations 10h, project work (in a group) 100h including independent studies, final exam 3h and preparation for the exam 20h. The project work topic is flexible and enables realization of student-initiated ideas.

Target group:

Mechanical engineering students in their Master's studies, 4th year.

Prerequisites and co-requisites:

Machine drawing and CAD, Computer aided design.

Recommended optional programme components:

Introduction to materials for mechanical engineering, Materials for mechanical engineering, Welding and heat treatment of metals.

Recommended or required reading:

Course notes (mainly in Finnish), contemporary articles. References: Boljanovic, V.: Sheet metal forming processes and die design, Industrial Press, Inc., New York, 2004, 219 p. Hosford, W. F. & Caddell, R. M.: Metal Forming - Mechanics and Metallurgy, 3rd Ed, Cambridge University Press, New York, 2007, 328 p SSAB: Design Handbook, 2012. SSAB: Sheet Steel Forming Handbook, 1997. SSAB:Welding Handbook. SSAB: Sheet Steel Joining Handbook, 2004. Schuler GmbH (Ed.): Metal forming handbook, Springer, Verlag, Berlin, 1998. 588 s.

Assessment methods and criteria:

Final exam. The final grade is based on the combined points from the exam (0.5), seminar and practical work (0.5).

Grading:

1 to 5, zero denotes failure to pass.

Person responsible:

Jyri Porter

Other information:

The course objective is to familiriaze students especially with methods for manufacturing parts used in mechanical engineering.

465113S: Failure mechanisms in metals, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Nousiainen, Olli Pekka

Opintokohteen kielet: Finnish

Leikkaavuudet:

465079S Failure Analysis 3.5 op

ECTS Credits:

5 ECTS/135 h study time

Language of instruction:

Finnish

Timing:

Spring semester, period 4. Recommended for fourth year of studies.

Learning outcomes:

After completion of the course, the student will be able to explain the effects of mechanical and environmental loads on the possible failure mechanisms in alloys. (S)he will be able to avoid unsuitable choices of materials in various applications. (S)he will be able to list the stages involved in a typical failure analysis. The student will be able to determine the most likely failure mechanism on the basis of the macroscopic and microscopic features of fracture surfaces. (S)he will be able to give rational instructions for avoiding failures.

Contents:

Failure mechanisms at low and high temperatures under static and dynamic loading. Failures caused by corrosion. Macroscopic and microscopic features of fracture surfaces. General principles and approaches to failure analysis. Failures induced by hydrogen. Practical examples of failure cases.

Mode of delivery:

Face to face

Learning activities and teaching methods:

Lectures 32 h / independent study 103 h.

Target group:

Compulsory in the masters stage for all Mechanical Engineering students majoring in Materials Engineering.

Prerequisites and co-requisites:

Before registering for this course the student must have successfully completed the following courses: 465101A An Introduction to Materials for Mechanical Engineering, 465102A Materials for Mechanical Engineering, 465105A Research techniques for materials, and 465107A An Introduction to Physical Metallurgy.

Recommended or required reading:

Study guide and lecture slides. Additional material: Wulpi, D.J.: Understanding How Components Fail, ASM 1985. Engel L. and Klingele H.: Atlas of Metals Damage, Carl Hauser Verlag.

Assessment methods and criteria:

Final grade assessed on the basis of final examination.

Grading:

Pass grades on a scale of 1-5. Grade 0 fail.

Person responsible:

Olli Nousiainen

461108A: Mechanics of materials, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Koivurova Hannu

Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS credits / 90 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the Autumn semester, during periods 1 and 2. It is recommended to complete the course at the 3rd autumn semester.

Learning outcomes:

Upon completing the required coursework, the student knows the theoretical background of the strength of materials and he/she is able to apply the theory of the strength of materials to different kind of design problems needed in engineering mechanics. He/she understand the fundamental concepts of mechanics of deformable solids; including static equilibrium, geometry of deformation, and material constitutive behavior. He/she can discuss the basic mechanical principles underlying modern approaches for modelling of various types of materials under a different type of loadings. This provide students with exposure to the systematic methods for solving engineering problems in solid mechanics. He/she can also build the necessary theoretical background for further structural analysis and design courses.

Contents:

The general equations of mechanics. The stress and strain state. Different material models; Linear elastic material, isotropic, transverse-isotropic and orthotropic material models. The concept of strain energy. Theory of plasticity. Yield criterion, plastic flow rule and hardening. Limit state design. Introduction to visco elastic material and creep teory.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 30 h / Exercise 30 h / Self-study 30 h.

Target group:

Students of the Bachelor Stage of the Mechanical Engineering Degree Programme

Prerequisites and co-requisites:

Recommended: Strength of Materials I and II and the knowledge of vector and matrix calculations.

Recommended optional programme components:

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

Recommended or required reading:

Salmi, T., Virtanen, S. (2008) Materiaalien Mekaniikka. Pressus Oy.

Assessment methods and criteria:

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

Grading:

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

Person responsible:

University Lecturer Hannu Koivurova

461109A: Finite element methods II, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Lumijärvi, Jouko Veikko Juhani

Opintokohteen kielet: Finnish

Leikkaavuudet:

461034A	Finite Element Methods II	3.5 op
461034A-01	Finite Element Methods II, examination	0.0 op
461034A-02	Finite Element Methods II, exercises	0.0 op

ECTS Credits:

5 ECTS credits / 132 hours of work

Language of instruction:

Finnish

Timing:

Lectures and exercises, periods 3.-4.

Learning outcomes:

The aim of this course is for students to gain an understanding of the basic idea and restrictions of FEM in dynamic and buckling analyses and the preparedness to use commercial FE-programs.
After this course, the student can explain the basic idea of the FEM in the case of two- and three dimensional, geometrically complicated structures. In addition to the linear displacement and heat transfer problems, he/she is able to critically utilize the ready to use FEM-programs in the analysis of buckling-, modal- and dynamic problems. Also, the student knows the basic types of nonlinearity and recognizes their effect on the computations.

Contents:

Shell and solid elements. Buckling and modal analyses. Dynamic analyses. An introduction to the nonlinearities.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures and exercises take place during periods 3.-4. The course can be passed by completing a final exam.

Target group:

Degree Programme in Mechanical Engineering students.

Prerequisites and co-requisites:

Strength of Materials I and II, Finite Element Methods I.

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. NAFEMS: A Finite Element Dynamics Primer, NAFEMS: Introduction to Nonlinear Finite Element Analysis.

Assessment methods and criteria:

The grade of the course is based on a final exam. The student must pass the exercises before taking the examination.

Grading:

Numerical grading scale 1-5.

Person responsible:

Jouko Lumijärvi

461113S: Finite element methods III, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Lumijärvi, Jouko Veikko Juhani
Opintokohteen kielet: Finnish
Leikkaavuudet:

461020S-01 Advanced Course in Finite Element Methods, examination 0.0 op
461020S-02 Advanced Course in Finite Element Methods, exercises 0.0 op
461020S Advanced Course in Finite Element Methods 5.0 op

ECTS Credits:

5 ECTS credits / 132 hours of work

Language of instruction:

Finnish

Timing:

Lectures and exercises, periods 1.-2.

Learning outcomes:

The aim of the course is to give students an enhanced understanding of the finite element method and to familiarize students with the analysis of non-linear problems.
Learning outcomes: Upon completion of this course, the student is able to apply the finite element method in analyzing the most important non-linear phenomena in engineering mechanics. He/she is able to choose suitable modeling and solution methods for different phenomena

Contents:

Static and dynamic non-linear phenomena in engineering mechanics: Geometric nonlinearity, buckling, contact problems and non-linear material models.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures and exercises take place during periods 1.-3. The course can be passed by a final exam.

Prerequisites and co-requisites:

Finite Element Methods I, Finite Element Methods II.

Recommended or required reading:

Lecture notes (in Finnish), Belytschko, T., Liu, W. K., Moran, B.: Finite Elements for Nonlinear Continua and Structures, John Wiley & Sons Ltd., 2000, Bathe, K.-J.: Finite Element Procedures, Prentice-Hall, 1996, Hinton, E.: NAFEMS Introduction to Nonlinear Finite Element Analysis, Bell and Bain Ltd., 1992.

Assessment methods and criteria:

The grade of the course is based on a final exam. The student must pass the exercises before taking the examination.

Grading:

Numerical grading scale 1-5.

Person responsible:

Jouko Lumijärvi

464108S: Advanced Topics on Machine Design, 5 - 10 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Niskanen, Juhani
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

466105S: Design of Steel Structures, 6 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Kangaspuoskari, Matti Johannes
Opintokohteen kielet: Finnish
Leikkaavuudet:

485118S Design of Steel Structures 5.0 op
485108A Desing of Steel Structures and Steel Construction 5.0 op
ay466105S Design of Steel Structures (OPEN UNI) 6.0 op
460127S-01 Design of Steel Structures, examination 0.0 op
460127S-02 Design of Steel Structures, exercise work 0.0 op
460125A Introduction to Design of Steel Structures 4.0 op
460125A-01 Introduction to Design of Steel Structures, examination 0.0 op
460125A-02 Introduction to Design of Steel Structures, exercise work 0.0 op
460127S Design of Steel Structures 4.0 op

ECTS Credits:

6 ECTS

Language of instruction:

Finnish

Timing:

Periods 1 and 2
Course 485108A replaces this course in academic year 2021-2022.

Learning outcomes:

After completing the course the student is able to explain the basic nature of the crystalline structure of steel and its elastomeric material model. He / she is able to evaluate the effect of alloys, heat treatment and welding on the mechanical properties of steel. He / she can explain what happens to steel in the event of a fire and the basics of fire design. The student is able to design the joints of a steel structure frame and can dimension the steel structure under different load combinations. He / she is able to analyze stability problems and can explain inaccuracies and second order effects.

Contents:

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

Mode of delivery:

Face-to-face.

Learning activities and teaching methods:

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

Target group:

Degree students who study steel structure design.

Prerequisites and co-requisites:

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

Recommended or required reading:

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

Assessment methods and criteria:

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

Grading:

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

Person responsible:

Matti Kangaspuoskari

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

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Kangaspuoskari, Matti Johannes

Opintokohteen kielet: Finnish

Leikkaavuudet:

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

ECTS Credits:

6 ECTS

Language of instruction:

Finnish

Timing:

Periods 3 and 4

Learning outcomes:

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

Contents:

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

Mode of delivery:

Face-to-face.

Learning activities and teaching methods:

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

Target group:

Degree students who study steel structure design.

Prerequisites and co-requisites:

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

Recommended or required reading:

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

Assessment methods and criteria:

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

Grading:

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

Person responsible:

Matti Kangaspuoskari

555343S: Product Data and product life cycle management, 5 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Erno Mustonen
Opintokohteen kielet: English
Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Period 3-4.

Learning outcomes:

The course familiarises students with the broad concepts of product data management (PDM) and product life cycle management (PLM). Upon completion of the course, the student will be able to:

- understand the basic terminology related to product, productisation, PDM and PLM
- analyse the current status of the productisation, product data structures, product life cycle management, commercial and technical product portfolios and related applications in case companies
- create strategic PDM and PLM concept based on the critical building blocks for one product data, product master data and product related business data
- model the company’s HW, SW and Service product related commercial and technical product portfolios according to productisation concept
- understand the PDM and PLM processes including key roles such as concept owners, education and support roles, data owners, data users including the product data quality concept
- create and implement the governance model for PDM and PLM process and IT development as a part of company’s business process development including PDM/PLM related information technology (IT) architecture for product master data and product related business data

Contents:

PDM and PLM strategic targets, productisation concept, commercial and technical product portfolios, PDM and PLM processes and tools, governance model and related IT applications and architecture

Mode of delivery:

The tuition will be implemented as face-to-face teaching, course readings and by a practical assignment which is a common with a course 555346S Product portfolio management.

Learning activities and teaching methods:

Face-to-face teaching 20 h (lectures), practical assignment (group work) and self-study 114 h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

555242 Product development

Recommended optional programme components:

555350S Research and technology management, 555351S Advanced course in product development, 555346S Product portfolio management

Recommended or required reading:

Lecture materials and selected articles.

Assessment methods and criteria:

Group work report (50 % of the grade) and exam (50 % of the grade).

Grading:

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

Person responsible:

D. Sc. Erno Mustonen

Working life cooperation:

The group work will be done in cooperation with case companies.

Other information:

Previous course name was 'Product Data Management'.

462111S: Machine diagnostics, 10 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jouni Laurila

Opintokohteen kielet: Finnish

Leikkaavuudet:

464088S	Diagnosis of Machine Condition	8.0 op
464088S-01	Diagnosis of Machine Condition, examination	0.0 op
464088S-02	Diagnosis of Machine Condition, exercises	0.0 op

ECTS Credits:

10 ECTS credits / 270 hours of work

Language of instruction:

Finnish

Timing:

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

Learning outcomes:

After completing the course the student will be able to use various methods of machine diagnostics and use the most common measuring devices to determine the functioning and condition of machines. He / she is able to apply the key indicators and signal processing methods used in condition monitoring and to analyze the frequency content of signals in order to solve problems related to the operation of machines. They will be able to draw up a measurement plan, make measurements, analyze the data obtained and report the results obtained. He / she is also able to evaluate what factors affect the reliability and comparability of measurements. The student is able to use industry standards to help evaluate the condition of machinery and the vibration intensity. They will be able to understand the importance of machine diagnostics in the success and productivity of maintenance.

Contents:

Major methods and measurement techniques used in machine diagnostics, machine vibration analysis and fault detection, key signal processing methods, measurement design, implementation and reporting, machine balancing, industry standards.

Mode of delivery:

Face-to-face teaching

Target group:

Master's degree students in the mechanical engineering

Prerequisites and co-requisites:

The recommended prequisite is the completion of the following course: 462107A Maintenance of Machines, 462105A Sensor technology for Machines.

Recommended optional programme components:

The course is an independent entity.

Recommended or required reading:

Lecture handout and the other material delivered during the course. Supplementary readings: Mills, S.R. W., Vibration Monitoring & Analysis Handbook, BINDT, 2010. Mikkonen, H. (toim.), Kuntoon perustuva kunnossapito, KP-Media Oy, 2009. PSK-käsikirja 3: Kunnonvalvonnan värähtelymittaus, PSK Standardisointiyhdistys ry, 2019.

Assessment methods and criteria:

Final examination and the other graded assignments

Grading:

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

Person responsible:

Jouni Laurila

462112S: Measuring instruments in machine diagnostics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Konsta Antero Karioja

Opintokohteen kielet: Finnish

Leikkaavuudet:

464089S-01 Measuring Instrumentation and Techniques for Diagnosis of Machine Condition, examination 0.0 op

464089S-02 Measuring Instrumentation and Techniques for Diagnosis of Machine Condition, exercises 0.0 op

464089S Measuring Instrumentation and Techniques for Diagnosis of Machine Condition 5.0 op

ECTS Credits:

5 ECTS credits / 135 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the autumn semester, during period 1 and 2. It is recommended to complete the course at the 5th autumn semester.

Learning outcomes:

After completing the course, the student will be able to design, construct and calibrate the various measurement chains needed in machine diagnostics. They are able to use data loggers, analyzers, PC-based measurement systems, data acquisition cards and various filters, and other typical measuring instruments and know how they work, which is central to test diagnostics. The student also identifies the most important sources of error that affect the reliability and comparability of measurement results.

Contents:

Sensors and instrumentation for machine diagnostics, other equipment, design of measurement systems, evaluation and calibration of performance, and main signal processing methods in machine diagnostics.

Mode of delivery:

Face-to-face teaching

Target group:

Master's degree students in the mechanical engineering

Prerequisites and co-requisites:

The recommended prequisite is the completion of the following courses: 462105A Sensor technology for machines, 462107A Maintenance of Machines and 462111S Machine Diagnostics.

Recommended optional programme components:

The course is an independent entity.

Recommended or required reading:

Lecture handout and the other material delivered during the course. Supplementary readings: Mills, S.R. W., Vibration Monitoring & Analysis Handbook, BINDT, 2010. Mikkonen, H. (toim.), Kuntoon perustuva kunnossapito, KP-Media Oy, 2009. PSK-käsikirja 3 – Kunnonvalvonnan värähtelymittaus, PSK Standardisointiyhdistys ry, 2012.

Assessment methods and criteria:

Final examination and the other graded assignments

Grading:

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

Person responsible:

Konsta Karioja

A460249: Supplementary Module/Mechactronics and Machine Diagnostics, Mechatronics, 20 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Supplementary Module
Laji: Study module
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

eng

521287A: Introduction to Computer Systems, 5 op

Voimassaolo: 01.08.2016 -
Opiskelumuoto: Intermediate Studies
Laji: Course

Vastuuyksikkö: Computer Science and Engineering DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Teemu Leppänen

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay521287A	Introduction to Computer Systems (OPEN UNI)	5.0 op
521142A	Embedded Systems Programming	5.0 op

ECTS Credits:

5

Language of instruction:

Lecturing in Finnish, course and exercise material available in English.

Timing:

Autumn, periods 1-2.

Learning outcomes:

Upon completing the course, the student understands the basics of computer architecture and CPU operation.
Student knows number systems and data representations in computer.
Student is familiar of I/O operation with peripheral devices.
Student is able to implement small programs with the C programming language for workstations and embedded systems.
Student recognizes how embedded systems programming is different from programming general-purpose computers.

Contents:

Overview of computer architecture and CPU, data types and memory management, interrupts, registers and I/O, general computer and embedded systems programming, basics of the C programming language.

Mode of delivery:

Web-based teaching + face-to-face teaching.

Learning activities and teaching methods:

Lectures (20h), course exercises (10-20h), laboratory exercise (3h) and course project in a group.

Target group:

Students of the University of Oulu

Prerequisites and co-requisites:

Elementary Programming 521141P

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 material are available in the course website.
For English speaking students, either of the following material may be useful:
Patterson & Hennessy, Computer Organization and Design: The Hardware/Software Interface, 5th Edition, Chapter 1.
Bryant & O'Hallaron, Computer Systems: A Programmer's Perspective, 3rd Edition, Chapter 1.
Patterson & Hennessy, Computer Organization and Design, 5th Edition: The Hardware/Software Interface, 2014.
Bryant & O'Hallaron, Computer Systems: A Programmer's Perspective, 2016.

Assessment methods and criteria:

The assessment criteria is based on the learning outcomes of the course. Students complete the course exercises, participate to the laboratory exercise and complete the course project in a group. Assessment is based on the exercises and the course project. More detailed information on assessment is published in the lecture material.

Grading:

Numerical grading scale 1-5, zero stands for fail.

Person responsible:

Teemu Leppänen

Working life cooperation:

Visiting lectures with experts from local industry are possible.

Other information:

The course learning platform is Lovelace (lovelace.oulu.fi)
This course replaces the course 521142A Embedded systems programming.

521077P: Introduction to Electronics, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Electrical Engineering DP
Arvostelu: 1 - 5, pass, fail
Opettajat: Jari Hannu
Opintokohteen kielet: Finnish
Leikkaavuudet:

ay521077P	Introduction to Electronics (OPEN UNI)	5.0 op
521209A	Electronics Components and Materials	2.0 op

ECTS Credits:

5 ECTS credits / 132,5 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the 1st period. It is recommended to complete the course at the 1st autumn semester.

Learning outcomes:

1. Student understands the block structures of electronic devices and their signal processing paths.

2. Student can identify the interfaces of analog and digital electronics and the software operations.

3. Student is able to identify and classify electronics components and compare their properties.

4. Students can describe electric conductivity and apply the phenomenon on designing and choosing resistors

5. Student is able to estimate the difference between dielectric materials and how they affect the properties of a capacitor.

6. Student can compare properties of magnetic materials and how identify they effect on inductive components.

7. Student can identify semiconductivity and is able to list typical semiconductor components.

8. Student can classify different circuit board techniques and is able to choose proper coupling techniques.

9. Student can identify the future technologies of electronics materials.

Contents:

Structures and interfaces of electronic devices. 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:

Face-to-face teaching and independent work.

Learning activities and teaching methods:

The implementation methods of the course vary. The course will be arranged utilizing activating teaching methods agreed on together with the students. There will be 48 hours of guided teaching events and 84.5 hours of teaching without guidance either privately or in a group.

Target group:

First year electrical engineering students.

Prerequisites and co-requisites:

No prerequisites.

Recommended optional programme components:

-

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:

This course utilizes continuous assessment. During the course, there are two intermediate exams. In addition students will make course work which are graded. The assessment of the course is based on the learning outcomes of the course. Read more about assessment criteria at the University of Oulu webpage.

Grading:

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

Person responsible:

Jari Hannu

Working life cooperation:

No

Other information:

-

031077P: Complex analysis, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Basic Studies

Laji: Course

Vastuuyksikkö: Applied Mathematics and Computational Mathematics

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Kemppainen

Opintokohteen kielet: Finnish

Leikkaavuudet:

ay031077P	Complex analysis (OPEN UNI)	5.0 op
031018P	Complex Analysis	4.0 op

ECTS Credits:

5 ECTS credits / 135 hours of work

Language of instruction:

Finnish

Timing:

Fall semester, period 1.

Learning outcomes:

After completing the course the student

1. is able to calculate the derivative and the integral of functions of complex variable,
2. understands the concept of analyticity

3. is capable of calculating the contour integrals and using the theory of residues for computing the line integrals, will be able to apply the techniques of complex analysis to simple problems in signal processing.

Contents:

Complex numbers and functions, complex derivative and analyticity, complex series, Cauchy's integral theorem, Laurent and Taylor expansions, theory of residues, applications to signal analysis.

Mode of delivery:

Face-toface teaching, Stack(web-based too) exercises.

Learning activities and teaching methods:

Lectures 28 h/Exercises 14 h/Self study 93 h.

Target group:

The students in the engineering sciences. The other students are welcome, too.

Prerequisites and co-requisites:

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

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:

The lecture notes

Assessment methods and criteria:

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

Grading:

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

Person responsible:

Jukka Kemppainen

Working life cooperation:

-

031080A: Signal Analysis, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Applied Mathematics and Computational Mathematics
Arvostelu: 1 - 5, pass, fail
Opettajat: Kotila, Vesa Iisakki
Opintokohteen kielet: Finnish
Leikkaavuudet:

031050A	Signal Analysis	4.0 op

ECTS Credits:

5 ECTS credits / 135 hours of work

Language of instruction:

Finnish.
The course can be completed in English by a final exam.

Timing:

The course is held in the autumn semester, during period II. It is recommended to complete the course at the 2nd autumn semester.

Learning outcomes:

Upon completion of 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
-is able to study the effect of sampling on the signal
-is able to calculate the Hilbert transform and the complex envelope of a signal
-is able to study the stationarity, the mutual dependence and the frequency content of random signals by means of the auto- and cross-correlation functions, and the power- and cross-power spectral densities
-is able to study the effect of an LTI system on a signal

Contents:

Signals, classification, frequency. Fourier analysis, analog and digital signal, fast Fourier transform. LTI system. Hilbert transform. AM- FM- and PM-modulation. Random variable. Covariance matrix. Random signal. Stationarity, autocorrelation. Power spectral density. Random signal in LTI system. Signal estimation.

Mode of delivery:

The lectures and exercise classes will be arranged as distance learning via Zoom. The Zoom-links, directions and other material (in Finnish) will be made available in the Moodle-workspace for the course, which can be found at https://moodle.oulu.fi/course/view.php?id=5361

Learning activities and teaching methods:

Lectures 28 h / Exercises 14 h / Self-study privately or in a group 93 h. The independent work includes individual STACK-assignments as online work.

Target group:

-

Prerequisites and co-requisites:

The recommended prerequisite is the completion of the courses 031078P Matrix Algebra, 031021P Probability and Mathematical Statistics and 031077P Complex 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. Additional reading: Proakis, J.G., Manolakis, D.K.: Introduction to Digital Signal Processing. Shanmugan, K.S., Breipohl, A.M.: Random Signals, Detection, Estimation and Data Analysis.

Assessment methods and criteria:

The course is completed with mid-term exams or a final exam. When completed with mid-term exams, exercise assignments are part of the continuous assessment. The assessment of the course is based on the learning outcomes of the course.

Grading:

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

Person responsible:

Vesa Kotila

Working life cooperation:

-

521431A: Principles of Electronics Design, 5 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Electrical Engineering DP
Arvostelu: 1 - 5, pass, fail
Opettajat: Ilkka Nissinen
Opintokohteen kielet: Finnish

ECTS Credits:

5

Language of instruction:

Finnish.

Timing:

Spring, period 3

Learning outcomes:

1. 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, 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, operational amplifier.

Mode of delivery:

Remote teaching.

Learning activities and teaching methods:

Lectures 30 h and exercises 20 h. Link to Moodle https://moodle.oulu.fi/course/view.php?id=5894.

Target group:

Students of Electrical engineering. Other students of the University of Oulu may also participate.

Prerequisites and co-requisites:

Circuit Theory I

Recommended optional programme components:

Recommended course Principles of Semiconductor Devices.

Recommended or required reading:

Lecture notes and Behzad Razavi, “Microelectronics”, 2nd Edition, ISBN 9781-118-16506-5
John Wiley & Sons 2015

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:

Respon responsible: Ilkka Nissinen
Lecturer: Juha Häkkinen
Assistant: Tuomo Talala

Working life cooperation:

-

521302A: Circuit Theory 1, 5 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Electrical Engineering DP
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:

Spring, period 4

Learning outcomes:

After the course the student can

1. write and solve the equations describing the operation of a given electrical circuit

2. solve the sinusoidal steady-state solution using complex phasor arithmetics

3. solve time responses of electric circuits

4. simplify electrical circuits e.g. using equivalent circuits

5. 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, 22h exercises, and a simulation exercise.

Target group:

Finnish BSc students.

Prerequisites and co-requisites:

Matrix algebra, complex arithmetics, differential equations.

Recommended optional programme components:

Background to all analog electronics cources.

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:

-

521150A: Introduction to Internet, 5 op

Voimassaolo: 01.08.2012 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Electrical Engineering DP
Arvostelu: 1 - 5, pass, fail
Opettajat: Erkki Harjula
Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS credits / 133 hours of work

Language of instruction:

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

Timing:

Spring, period 4.

Learning outcomes:

Upon completion of this course, students know and understand the basic concepts, know the key terminology and can write clearly with justifications about the following key areas of the course, which are:

1. The design principles of the Internet, its architecture, functionality and challenges
2. The role of the data link layer and the most important access network technologies
3. The structure and the most important protocols of the TCP/IP protocol stack
4. The most important internet applications and their protocols
5. The basic principles of internet security and multimedia applications

Additionally, students who have attained grades 2 or 3 have demonstrated satisfactory capability to perform practical software implementation work and/or solving Internet-related problems relevant to most centric course key areas. Students who have attained grades 4 or 5 have demonstrated solid capability to perform practical software implementation work and analytical skills for solving technical and research problems relevant to the course key areas.

Contents:

The design principles and architecture of the Internet, data link layer and most important access network technologies, TCP/IP protocol stack and its most important protocols, most important Internet applications, principles of Internet security and multimedia, internet's challenges and Future Internet.

Mode of delivery:

Remote teaching.

Learning activities and teaching methods:

Remote teaching: Lectures 32h, exercices 16h, laboratory exercises 12h, course work 25h, independent work 48h. Work is done in groups or independently.
Details of arrangement can be found from the course web page in Moodle: https://moodle.oulu.fi/course/view.php?id=4029

Target group:

Communications Engineering, Computer Science and Engineering students, Information Processing Science students, other students of the University of Oulu.

Prerequisites and co-requisites:

None.

Recommended optional programme components:

None.

Recommended or required reading:

Announced at the beginning of the course.

Assessment methods and criteria:

Passing the course requires mastery of the essential core content of the course. Continuous assessment and exams are provided for students to show that they have attained this level. Higher grades are attained by participating in and completing, either alone or in groups, to non-mandatory exercises and exams on advanced course topics. More detailed information on assessment is published yearly in the lecture material.

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

Grading:

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

Person responsible:

D.Sc. Erkki Harjula

Working life cooperation:

None.

811312A: Data Structures and Algorithms, 5 op

Voimassaolo: 01.08.2010 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Information Processing Science DP

Arvostelu: 1 - 5, pass, fail

Opettajat: Juustila, Antti Juhani

Opintokohteen kielet: Finnish

Leikkaavuudet:

521144A	Algorithms and Data Structures	6.0 op

ECTS Credits:

5 ECTS credits / 133 hours of work.

Language of instruction:

Finnish

Timing:

The course is held in the autumn semester, during period 2. It is recommended to complete the course in the 2nd autumn semester of the Bachelor's studies.

Learning outcomes:

After completing the course the student will be able to:
* select data structures and algorithms to an application,
* apply induction when proving algorithm correctness and define recursive algorithms,
* describe trees, graphs and their basic algorithms and apply them in a program,
* describe the most common sorting algorithms, as well as
* analyse the correctness and time complexity of an algorithm implemented in a program.

Contents:

* Basic data structures
* Analysis of algorithms
* Sorting algorithms
* Hash tables
* Binary search trees
* Graphs and their algorithms
* Algorithm design paradigms

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 48 h, exercises 21 h, exercise work 27 h, independent study 39 h.

Target group:

BSc students.

Prerequisites and co-requisites:

The required prerequisite is that the learning outcomes of the following courses are accomplished: Databases

Recommended optional programme components:

Recommended or required reading:

Cormen, Leiserson, Rivest, Stein: Introduction to algorithms, Second edition, MIT Press 2001 (or newer) and other material defined during the course.

Assessment methods and criteria:

1. Exam and assignment OR 2. Mid-term exams (2) and assignment

Grading:

Numerical scale 1-5 or fail.

Person responsible:

Antti Juustila

477622A: Control System Design, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Ikonen, Mika Enso-Veitikka

Opintokohteen kielet: Finnish

Leikkaavuudet:

477603A	Control System Design	4.0 op

ECTS Credits:

5 ECTS / 133 hours of work

Language of instruction:

Finnish (available in English as a book exam: students will receive materials to study and take an final exam based on those materials)

Timing:

Period 3 (spring term)

Learning outcomes:

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

Contents:

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

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures and exercises

Target group:

B.Sc. students in process and environmental engineering

Prerequisites and co-requisites:

The courses 477011P Introduction to process and environmental engineering I, 488010P Introduction to process and environmental engineering and 477602A Control system analysis recommended beforehand

Recommended optional programme components:

None

Recommended or required reading:

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

Assessment methods and criteria:

Exam

Grading:

Numerical grading scale 1-5 or fail

Person responsible:

Professor Enso Ikonen and university teacher Seppo Honkanen

Working life cooperation:

No

477502A: Experiment design and analysis, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Aki Sorsa

Opintokohteen kielet: Finnish

Leikkaavuudet:

470432A Process Control Engineering II 5.0 op

ECTS Credits:

5 ECTS /133 hours of work

Language of instruction:

Finnish

Timing:

Implementation in the 4th period on the spring term.

Learning outcomes:

After the course, the student knows different experimental design methods and their applicability for different problems. He can also design experiments for multi-variable processes and analyze the results. He can also use some basic means to visualize the results got from experimental data and choose proper tools for experiment design problems.

Contents:

Systematic design of process experiments with matrix techniques (Hadamard, Central Composite Design). Graphical and statistical analysis of experimental data. Correlation, regression and variance analysis.

Mode of delivery:

Lectures and extensive exercise work

Learning activities and teaching methods:

Lectures during one period

Target group:

Bachelor’s students in process and environmental engineering

Prerequisites and co-requisites:

Course Process Dynamics is 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:

Reading materials. *Additional literature*: Diamond W.J.: Practical Experiment Designs. Lifetime Learning Publications. Belmont, California, 1981. 348 pp.

Assessment methods and criteria:

Homework and written/oral test. It is recommended to take the course also according to the principle of continuous evaluation.

Grading:

The course unit utilizes a numerical grading scale 1-5. In the numerical scale zero stands for a fail. Read more about assessment criteria at the University of Oulu webpage.

Person responsible:

Aki Sorsa

Working life cooperation:

No

477607S: Advanced Control and Systems Engineering, 5 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Ikonen, Mika Enso-Veitikka

Opintokohteen kielet: Finnish

Leikkaavuudet:

470444S	Advanced Control Methods	6.0 op

ECTS Credits:

5 ECTS, 135 h of work

Language of instruction:

Finnish (available in English as a book exam: students will receive materials to study and take an final exam based on those materials)

Timing:

Period 3

Learning outcomes:

After completing the course the student can design the model based control systems, can formulate and solve state estimation problems, and discover research trends in control and systems engineering.

Contents:

1. Model-based control: as DMC, QDMC; GPC. 2. State estimations: as Kalman filtering and particle filters. 3. Active research directions (elected annually).

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures and demonstration exercises

Target group:

M.Sc. students in process and environmental engineering

Prerequisites and co-requisites:

The courses 477621A Control system analysis, 477622A Control system design and 477624S Control system methods recommended beforehand

Recommended or required reading:

Materials distirbuted during the contact teaching and through the course web pages.

Assessment methods and criteria:

Exam and homework

Grading:

Numerical grading scale 1.5 or fail

Person responsible:

Professor Enso Ikonen

477525S: Computational intelligence in automation, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Aki Sorsa

Opintokohteen kielet: Finnish

Leikkaavuudet:

477505S Fuzzy-neuromethods in Process Automation 4.0 op

ECTS Credits:

5 ECTS / 135 hours of work

Language of instruction:

Finnish and English

Timing:

Implementation in the spring term, on the 3rd period. Recommended for 4th year students (first M.Sc. year)

Learning outcomes:

After the course the student is capable of explaining the concepts of intelligent systems and operation principles of fuzzy set systems, neural networks, neuro-fuzzy systems and evolutionary computation. The student has skills to construct and tune fuzzy models in Matlab-Simulink environment and to explain the operation of these models. The student is able to explain in an integrating way the principle concepts of neural computing and construct neural network models in Matlab-Simulink environment. The student is able to explain the operation principles of genetic algorithms and to use them in tuning of fuzzy set systems and neural network models.

Contents:

Fuzzy logic and fuzzy set systems, fuzzy calculus, fuzzy modelling and control, neural computation, neuro-fuzzy methods and evolutionary computation.

Mode of delivery:

Tuition is implemented mainly as face-to-face teaching.

Learning activities and teaching methods:

The amount of guided teaching is 40 hrs including lectures, exercises and a possible seminar presentation. As a self-study, students carry out homework, case study and seminar presentation preparation.

Target group:

M.Sc. students in process and environmental engineering, machine engineering, computer engineering and industrial engineering and management.

Prerequisites and co-requisites:

No specific prerequisites, but skills for simulation, and programming in Matlab are a benefit.
See "Recommended optional programme components" below.

Recommended optional programme components:

Courses Simulation, and Programming in Matlab reinforce abilities for the exercises and the case study.

Recommended or required reading:

Lecture notes and materials. Other literature.

Assessment methods and criteria:

This course uses continuous assessment that includes homework, classroom or home exams, case study and a possible seminar presentation.
Read more about the course assessment and grading systems of the University of Oulu at www.oulu.fi/english/studying/assessment

Grading:

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

Person responsible:

Aki Sorsa

Working life cooperation:

No

462113S: Advanced topics on mechatronics and machine diagnostics, 5 - 10 op

Voimassaolo: 01.12.2016 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

ay462113S	Advanced topics on mechatronics and machine diagnostics (OPEN UNI)	5.0 op

Voidaan suorittaa useasti: Kyllä

Person responsible:

Toni Liedes

464105S: Computer aided design, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

462044S-01	Computer Aided Design, examination	0.0 op
462044S-02	Computer Aided Design, exercise work	0.0 op
462044S	Computer Aided Design	3.5 op

ECTS Credits:

5 ects / 133 hours of studying work.

Language of instruction:

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

Timing:

Lectures and exercises arranged spring during periods 3. Recommended date of performance 4th year spring.

Learning outcomes:

After completing the course, the student will know modern CAD/CAE tools, simulation and virtual validation possibilities with CAD/CAE systems. The best procedures in various design tasks have also become familiar. In addition, the student is familiar with the theory behind CAD systems related to the geometry of models and their modification. In addition, the student also has a basis for product information management and the use of design data in PDM/PLM systems.

Contents:

The course includes product design and product validation on a computer-aided basis. During the course, you will get acquainted with the possibilities of product design and validation of functionality using CAD

/CAE systems. Use of the computer in design functions and the applicable systems. Parametricity and customizability of the product play an important role. In addition,students learn what special tools design software offers.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 20 h/ exercises 30 h/ practical assignment 83 h. Exercises are carried out independently and the assignment in small groups.

Target group:

Master's Degree student of mechanical engineering, specially students studying Machine Design.

Prerequisites and co-requisites:

Machine Drawing and CAD, Design of Machine Elements.

Recommended optional programme components:

The course is an independent entity and does not require other studies to be completed at the same time.

Recommended or required reading:

e-Design Computer-Aided Engineering Design (Chang K-H., Elsevier, 2015)
In addition: Lee, K. Principles of CAD/CAM/CAE Systems, Addison-Wesley, Inc.: New York, 1999, 581 s.

Assessment methods and criteria:

Final exam, lecture exercises and exercise work. For the final grade, the exam has a weight factor of 0.4; for lecture exercises, 0.2; and for exercise work, 0.4.

Grading:

Numerical grading scale 1-5 / fail

Person responsible:

Jussi Salakka

464122A: Mobile hydraulics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jonne Untinen

Opintokohteen kielet: Finnish

Leikkaavuudet:

460076A	Mobile Hydraulics	3.5 op

ECTS Credits:

5 ects cr/ 133 hours of student's work

Language of instruction:

Finnish

Timing:

Lectures and exercises during periods 3.-4.

Learning outcomes:

The objective of the course is to provide the students with a general idea of the design and dimensioning of hydraulic systems used in mobile machines. Upon completion of the course, the student is able to describe the basic circuits and characteristics in mobile hydraulics. The student can also describe the most important components and operational preconditions of the mobile hydraulic system The student is able design simple mobile hydraulic systems. Furthermore, the student is able have discussions with the experts in the field of mobile hydraulics using relevant terminology. The student is also capable of dimensioning the simple hydraulic drivetrain systems.

Contents:

Applications of hydraulic systems in mobile machines; Fundamentals of proportional- and hydraulic technique;. Components and their properties; Basics of design and dimensioning; Maintenance and safety of hydraulic systems. Basics of the digital valves and valve control systems.

Mode of delivery:

Distance-teaching.

Learning activities and teaching methods:

The course consists of distance-teaching 20 h, distance-guided exercises 20 h, exercise work and homework. 95 hours of independent studying.

Target group:

Mechannical Engineering Master's students.

Prerequisites and co-requisites:

462104A Machine automation, 462109S Machine modelling and simulation

Recommended or required reading:

Fonselius, J: Koneautomaatio: Hydrauliikka. 1995. Fonselius, J: Koneautomaatio: Servotekniikka. 1998. Mäkinen, R: Hydrauliikka II. 3rd ed. 1991. Louhos, P&J-P: Ajoneuvo- ja työkonehydrauliikat. 1992. Current publications in the field of mobile machines and hydraulics.

Assessment methods and criteria:

Final exam, The grade is determined by the sum of examination and exercises

Grading:

Numerical grading scale 1-5.

Person responsible:

Jonne Untinen

461107A: Finite Element Methods I, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Lumijärvi, Jouko Veikko Juhani

Opintokohteen kielet: Finnish

Leikkaavuudet:

461033A	Finite Element Methods I	3.5 op
461033A-01	Finite Element Methods I, examination	0.0 op
461033A-02	Finite Element Methods I, exercises	0.0 op

ECTS Credits:

5 ECTS credits / 132 hours of work

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. After this course, the student can explain the basic idea of the FEM. He/she can analyze simple truss-, frame- and plane structures and explain the theoretical background of the calculations.

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.-2.

Target group:

Students of the bachelor's stage of the Mechanical Engineering Degree Programme.

Prerequisites and co-requisites:

Strength of Materials I and II and Fundamentals of mechanical computing and programming

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:

The grade of the course is based on a final exam. The student must pass the exercises before taking the examination.

Grading:

Numerical grading scale 1-5.

Person responsible:

Jouko Lumijärvi

555343S: Product Data and product life cycle management, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Erno Mustonen

Opintokohteen kielet: English

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Period 3-4.

Learning outcomes:

The course familiarises students with the broad concepts of product data management (PDM) and product life cycle management (PLM). Upon completion of the course, the student will be able to:

- understand the basic terminology related to product, productisation, PDM and PLM
- analyse the current status of the productisation, product data structures, product life cycle management, commercial and technical product portfolios and related applications in case companies
- create strategic PDM and PLM concept based on the critical building blocks for one product data, product master data and product related business data

- model the company’s HW, SW and Service product related commercial and technical product portfolios according to productisation concept
- understand the PDM and PLM processes including key roles such as concept owners, education and support roles, data owners, data users including the product data quality concept
- create and implement the governance model for PDM and PLM process and IT development as a part of company’s business process development including PDM/PLM related information technology (IT) architecture for product master data and product related business data

Contents:

PDM and PLM strategic targets, productisation concept, commercial and technical product portfolios, PDM and PLM processes and tools, governance model and related IT applications and architecture

Mode of delivery:

The tuition will be implemented as face-to-face teaching, course readings and by a practical assignment which is a common with a course 555346S Product portfolio management.

Learning activities and teaching methods:

Face-to-face teaching 20 h (lectures), practical assignment (group work) and self-study 114 h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

555242 Product development

Recommended optional programme components:

555350S Research and technology management, 555351S Advanced course in product development, 555346S Product portfolio management

Recommended or required reading:

Lecture materials and selected articles.

Assessment methods and criteria:

Group work report (50 % of the grade) and exam (50 % of the grade).

Grading:

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

Person responsible:

D. Sc. Erno Mustonen

Working life cooperation:

The group work will be done in cooperation with case companies.

Other information:

Previous course name was 'Product Data Management'.

A460250: Supplementary Module/Mechactronics and Machine Diagnostics, Machine Diagnostics, 20 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Supplementary Module
Laji: Study module
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

e1

477525S: Computational intelligence in automation, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Aki Sorsa

Opintokohteen kielet: Finnish

Leikkaavuudet:

477505S Fuzzy-neuromethods in Process Automation 4.0 op

ECTS Credits:

5 ECTS / 135 hours of work

Language of instruction:

Finnish and English

Timing:

Implementation in the spring term, on the 3rd period. Recommended for 4th year students (first M.Sc. year)

Learning outcomes:

After the course the student is capable of explaining the concepts of intelligent systems and operation principles of fuzzy set systems, neural networks, neuro-fuzzy systems and evolutionary computation. The student has skills to construct and tune fuzzy models in Matlab-Simulink environment and to explain the operation of these models. The student is able to explain in an integrating way the principle concepts of neural computing and construct neural network models in Matlab-Simulink environment. The student is able to explain the operation principles of genetic algorithms and to use them in tuning of fuzzy set systems and neural network models.

Contents:

Fuzzy logic and fuzzy set systems, fuzzy calculus, fuzzy modelling and control, neural computation, neuro-fuzzy methods and evolutionary computation.

Mode of delivery:

Tuition is implemented mainly as face-to-face teaching.

Learning activities and teaching methods:

The amount of guided teaching is 40 hrs including lectures, exercises and a possible seminar presentation. As a self-study, students carry out homework, case study and seminar presentation preparation.

Target group:

M.Sc. students in process and environmental engineering, machine engineering, computer engineering and industrial engineering and management.

Prerequisites and co-requisites:

No specific prerequisites, but skills for simulation, and programming in Matlab are a benefit.
See "Recommended optional programme components" below.

Recommended optional programme components:

Courses Simulation, and Programming in Matlab reinforce abilities for the exercises and the case study.

Recommended or required reading:

Lecture notes and materials. Other literature.

Assessment methods and criteria:

This course uses continuous assessment that includes homework, classroom or home exams, case study and a possible seminar presentation.
Read more about the course assessment and grading systems of the University of Oulu at www.oulu.fi/english/studying/assessment

Grading:

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

Person responsible:

Aki Sorsa

Working life cooperation:

No

464106S: Production machine design, Paper machinery, 10 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

464074S-01	Paper Machinery Construction, examination	0.0 op
464074S-02	Paper machinery construction, seminar	0.0 op
464074S	Paper Machinery Construction	7.0 op

ECTS Credits:

10 ects / 267 hours of studying work

Language of instruction:

Finnish, can be completed in English as a book examination

Timing:

Lectures and seminars arranged during autumn and spring periods 1.- 3.

Learning outcomes:

Upon completion of this course the students can describe the most common problems of the production machines and know the effects of machine constructions to quality and production. During the course papermachine is used as an example of production machines. After the course students can explain the importance of the pulp and paper industry to domestic economy and can describe the main stages of paper making processes.

Contents:

Fundamentals of production machine structures and their design criteria. Detailed design criteria of paper machine parts, calenders, rolls as well as construction materials.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 100 h / seminars 12 h / company excursions 30 h / individual studies 60 h.

Target group:

Master's degree students of mechanical engineering or process engineering

Recommended or required reading:

Copies of lecture material

Assessment methods and criteria:

Two midterm exams or one final exam is required and accepted seminar.

Grading:

Numerical grading scale 1-5 / fail

Person responsible:

professor Juhani Niskanen

555330S: Sourcing Management, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Leikkaavuudet:

555323S Sourcing Management 3.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish. English material will also be used.

Timing:

Period 2

Learning outcomes:

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

- understand the overall concept of sourcing management
- know the key concepts of sourcing and purchase management and can explain these
- describe the structures of sourcing and purchasing organisations and can explain the meaning of sourcing management in the performance of operations
- analyse the purchasing activities in a company and can produce improvement proposals based on the analysis
- take part in the sourcing 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:

The tuition will be implemented as blended teaching (face-to-face teaching and a supervised group work).

Learning activities and teaching methods:

Face-to-face teaching 20 hrs (lectures/ assignment guidance 14 hrs, final seminar 6 hrs) group work 114 hrs.

Target group:

Industrial Engineering Management students.

Prerequisites and co-requisites:

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

Recommended optional programme components:

-

Recommended or required reading:

Lecture notes. Other material will be defined at the beginning of the course

Assessment methods and criteria:

The assessment is based on the group work.

Grading:

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

Person responsible:

Adjunct professor Jukka Majava

Working life cooperation:

The group work is done in cooperation with case companies.

Other information:

Substitutes course 555323S Sourcing Management.

461110S: Fluid mechanics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Koivurova Hannu

Opintokohteen kielet: Finnish

Leikkaavuudet:

461036S-01	Heat and Mass Transfer II, examination	0.0 op
461036S-02	Heat and Mass Transfer II, exercises	0.0 op
461036S	Heat and Mass Transfer II	3.5 op

ECTS Credits:

5 ECTS credits / 105 hours of work

Language of instruction:

Finnish

Timing:

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

Learning outcomes:

The aim of the course is to get acquainted with the basic concepts of flow technology, terminology, techniques for solving the main flow phenomena and flow problems and their application. After completing the course, the student will be able to use the terminology of flow mechanics and will be able to explain what the basic concepts of flow mechanics mean, what principles are the basic equations of flow mechanics and how the equations can be simplified. The student can explain the basic idea of dimensional analysis and apply it in flow mechanics, for example, to scale test results. The student will be able to solve simple flow problems, such as determining the volume flow, pressure drop or pump lift height of the piping and determining the forces and moments affecting the parts based on the flow velocities.

Contents:

Special features of fluids, statics of fluids, application of the ideal flow or Bernoulli equation, global equations of flow, ie flow rate equations, local flow equations and viscous flow, tube flow and its special features and dimensional analysis.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 30 h / Exercise 30 h / Self-study 45 h.

Prerequisites and co-requisites:

Recommended: Thermodynamics, dynamics and statics.

Recommended optional programme components:

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

Recommended or required reading:

Nakayama, Boucher, Introduction to Fluid Mechanics, Bathsworth-Heideman, 2000; Gerhart, Gerhart, Hochstein, Munson's fluid mechanics, John Wiley & Sons, Inc 2017; Munson, Rothmayer, Okiishi, Huebsch: Fluid mechanics, Wiley 2013. 7th ed.

Assessment methods and criteria:

The course is taken in the final exam. In addition, students complete homework throughout the course, which is assessed. One-third of homework assignments must be counted as approved. You can take the exam only after you have successfully completed your homework. The assessment of the course is based on the learning outcomes of the course. More detailed assessment criteria can be found in Moodle's course pages.

Grading:

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

Person responsible:

University Lecturer Hannu Koivurova

477625S: Power Plant Automation, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Process and Environmental Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jenö Kovács

Opintokohteen kielet: Finnish

Leikkaavuudet:

477611S	Power Plant Automation	2.0 op
477612S	Power Plant Control	3.0 op

ECTS Credits:

5 ECTS / 135 hours of work

Language of instruction:

Finnish (available in English as a book exam: students will receive materials to study and take an final exam based on those materials)

Timing:

Period 3 (spring term)

Learning outcomes:

The student has a full understanding of the role of the power plants in energy market and the importance of different energy sources. The student will understand the structure of different power plants, the main components and can explain their behavior and operation. The role and manner of measurements will be clarified. Furthermore, the student will understand the main principles in modelling energy systems. The student will fully understand the static and dynamic behaviour of the power plants and the sub processes. The student will understand the role of control in power plant operation and can describe the main principles and structures of control systems. The student can implement the theoretical knowledge gained in power plant automation courses into practice and has deepened his/her understanding in the subject. The student knows the principles of power plant operation in different situations (start-ups and shut-downs, load changes).

Contents:

Introduction to energy market and consumption. Description of different types of power plants and the main components and their operation. Fundamentals of industrial measurements, sensors, emissions and industrial actuators. Static and dynamic modelling of power plants. . The control principles and the main control loops. Comparison of different control solutions. 3 x 4h simulation exercises in small groups (2-4 persons) with a MetsoDNA power plant simulator.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures, exercises and industrial visit. Final exam.

Target group:

M.Sc. students in process and environmental engineering

Prerequisites and co-requisites:

No

Recommended or required reading:

Lecture hand-out and Joronen,T., Kovács J. & Majanne Y. (2007) Voimalaitosautomaatio. Suomen automaatioseura Oy. 276 pp.

Assessment methods and criteria:

Exam

Grading:

Numerical grading scale 1-5 or fail

Person responsible:

Docent Jenö Kovács

Working life cooperation:

No

465106A: Basics of corrosion in metals, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Jussi Paavola
Opintokohteen kielet: Finnish

ECTS Credits:

5 ects/135 hours study time

Language of instruction:

Finnish

Timing:

Lectures and laboratory works, 3. and 4. periods

Learning outcomes:

After the course, the student has the knowledge of corrosion when analyzing possibilities of corrosion in certain environments. In addition, the student is able to classify corrosion modes occurring in different metals and to select a suitable corrosion protection method for iron based metals.

Contents:

Corrosion mechanisms in metal alloys and corrosion protection techniques of metal alloys.

Mode of delivery:

Face-to face teaching

Learning activities and teaching methods:

32 hours lectures/ 4 hours laboratory exercises/ 99 hours independent studies. A laboratory exercise is included in the course.

Recommended or required reading:

Lecture handouts (In Finnish). Other material will be announced at the beginning of the course.

Assessment methods and criteria:

Final exam. The final grade is based on the final exam.

Grading:

Numerical grading scale 1 - 5. A laboratory exercise will be graded as "pass"/"fail".

Person responsible:

Jussi Paavola

555286A: Process and quality management, 5 op

Voimassaolo: 01.01.2014 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Osmo Kauppila
Opintokohteen kielet: Finnish
Leikkaavuudet:

ay555286A	Process and quality management (OPEN UNI)	5.0 op

555281A Basic Course of Quality Management 5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish.

Timing:

Period 4.

Learning outcomes:

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

- explain the role of process and quality management in a business organisation
- develop business processes based on the principles of quality management and appropriate tool

Contents:

Foundations of total quality management, planning of quality, performance measurement, process management, people management in relation to quality management, implantation of total quality management.

Mode of delivery:

The tuition will be implemented as face-to-face teaching (integrated classroom lectures and exercises).

Learning activities and teaching methods:

20 h lectures, 114 h independent study

Target group:

Industrial Engineering and Management students and other students studying Industrial Engineering and Management as minor.

Prerequisites and co-requisites:

-

Recommended optional programme components:

This course is part of the 25 ECTS module of Industrial engineering and management that also includes 555225P Basics of industrial engineering and management, 555285A Project management, 555242A Product development, and 555264P Managing well-being and quality of working life.

Recommended or required reading:

Oakland, J.S. (2014) Total quality management and operational excellence (4th ed.). Routledge, 529 pp. and material handed out during the course.

Assessment methods and criteria:

To pass the course, the student must pass the weekly course exercises (50 % of the course grade) and an exam (50 %).

Grading:

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

Person responsible:

University lecturer Osmo Kauppila.

Working life cooperation:

No.

Other information:

Substitutes course 555281A Basic Course of Quality Management.

031080A: Signal Analysis, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Applied Mathematics and Computational Mathematics

Arvostelu: 1 - 5, pass, fail

Opettajat: Kotila, Vesa Iisakki

Opintokohteen kielet: Finnish

Leikkaavuudet:

031050A Signal Analysis 4.0 op

ECTS Credits:

5 ECTS credits / 135 hours of work

Language of instruction:

Finnish.
The course can be completed in English by a final exam.

Timing:

The course is held in the autumn semester, during period II. It is recommended to complete the course at the 2nd autumn semester.

Learning outcomes:

Upon completion of 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
-is able to study the effect of sampling on the signal
-is able to calculate the Hilbert transform and the complex envelope of a signal
-is able to study the stationarity, the mutual dependence and the frequency content of random signals by means of the auto- and cross-correlation functions, and the power- and cross-power spectral densities
-is able to study the effect of an LTI system on a signal

Contents:

Signals, classification, frequency. Fourier analysis, analog and digital signal, fast Fourier transform. LTI system. Hilbert transform. AM- FM- and PM-modulation. Random variable. Covariance matrix. Random signal. Stationarity, autocorrelation. Power spectral density. Random signal in LTI system. Signal estimation.

Mode of delivery:

The lectures and exercise classes will be arranged as distance learning via Zoom. The Zoom-links, directions and other material (in Finnish) will be made available in the Moodle-workspace for the course, which can be found at https://moodle.oulu.fi/course/view.php?id=5361

Learning activities and teaching methods:

Lectures 28 h / Exercises 14 h / Self-study privately or in a group 93 h. The independent work includes individual STACK-assignments as online work.

Target group:

-

Prerequisites and co-requisites:

The recommended prerequisite is the completion of the courses 031078P Matrix Algebra, 031021P Probability and Mathematical Statistics and 031077P Complex 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. Additional reading: Proakis, J.G., Manolakis, D.K.: Introduction to Digital Signal Processing. Shanmugan, K.S., Breipohl, A.M.: Random Signals, Detection, Estimation and Data Analysis.

Assessment methods and criteria:

The course is completed with mid-term exams or a final exam. When completed with mid-term exams, exercise assignments are part of the continuous assessment. The assessment of the course is based on the learning outcomes of the course.

Grading:

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

Person responsible:

Vesa Kotila

Working life cooperation:

-

461116S: Experimental methods in engineering mechanics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Koivurova Hannu

Opintokohteen kielet: Finnish

Leikkaavuudet:

461028S-01	Experimental Methods in Engineering Mechanics, examination	0.0 op
461028S-02	Experimental Methods in Engineering Mechanics, exercises	0.0 op
461028S	Experimental Methods in Engineering Mechanics	6.0 op

ECTS Credits:

5 ECTS credits / 90 hours of work

Language of instruction:

Finnish

Timing:

Autumn semester

Learning outcomes:

The course focuses on experimental methods in engineering mechanics, where the student becomes familiar with measurements principles, application potentials and constraints. Learning outcomes: Student can make strain gage and vibration measurements in engineering mechanics field of know-how. With modal analysis tests, student can prepare measurements, make tests and estimate accuracy of the results and compare them to calculated results. He/she can find out characteristic magnitudes from the measurements. He/she can independently make strain gage measurements and estimate the inaccuracies.

Contents:

Strain gage and vibration measurements. Modal analysis tests.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Exercise 30 h / Self-study 60 h.

Prerequisites and co-requisites:

Recommended: Vibration Mechanics, Strenght Theory I & II.

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:

Mase, G., Smelser, R., Mase , G. (2010) Continuum Mechanics for Engineers. CRC Press Inc. Oheiskirjallisuus: Malvern, L. (1969) Introduction to the mechanics of a continuous medium. Prentice-Hall, Englewood Cliffs; Mattiasson, K. (1981) Continuum mechanics principles for large deformation problems in solid and structural mechanics. Publ. 81:6, Department of Structural Mechanics, Chalmers University of Technology; Fung, Y. (1965) Foundations of solid mechanics. Prentice-Hall, Englewood Cliffs.

Assessment methods and criteria:

The final grade is based on the combined points from exercises and final exam.The assessment of the course is based on the learning outcomes of the course. The more detailed assessment criteria are available on the Moodle Study Portal.

Grading:

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

Person responsible:

University Lecturer Hannu Koivurova

521092A: Electronic Measurement Techniques, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Electrical Engineering DP
Arvostelu: 1 - 5, pass, fail
Opettajat: Christian Schuss
Opintokohteen kielet: Finnish
Leikkaavuudet:

521171A	Electronic Measurement Techniques	6.5 op
521171A-01	Electronic measurement techniques, exam	0.0 op
521171A-02	Electronic measurement techniques, exercise work	0.0 op
521430A	Electronic Measurement Techniques	6.0 op

ECTS Credits:

5 ECTS credits / 132 h

Language of instruction:

In Finnish or in English if two or more foreign students participate.

Timing:

Period 4 academic year 20-21 and 21-22. Period l from academic year 22-23 forward.

Learning outcomes:

1. remembers the electrical measurement technique terminology associated to measurement systems, sensors and buses.
2. can name most important analog signal conditioning structures
3. can plan and implement basic measurements with electrical thermometers
4. can plan and implement basic measurements with optical meters
5. can name common sources of noise and interference and means to control them
6. can name methods to realize electrical quantities

Contents:

Broad view to electronic measurements.

Mode of delivery:

Pure face-to-face teaching.

Learning activities and teaching methods:

Lectures 28h and self-study 100h.

Target group:

Course is compulsory for electrical engineering students. Course is open for all students in University of Oulu.

Recommended optional programme components:

The course replaces previous courses with same name, but different credits and code.

Recommended or required reading:

Course material is in English and Finnish and can be found in Moodle.

Assessment methods and criteria:

The course is passed with a final exam.

Grading:

Numerical grading scale 1-5.

Person responsible:

Christian Schuss

Working life cooperation:

None.

Other information:

-

521302A: Circuit Theory 1, 5 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Electrical Engineering DP
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:

Spring, period 4

Learning outcomes:

After the course the student can

1. write and solve the equations describing the operation of a given electrical circuit

2. solve the sinusoidal steady-state solution using complex phasor arithmetics

3. solve time responses of electric circuits

4. simplify electrical circuits e.g. using equivalent circuits

5. 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, 22h exercises, and a simulation exercise.

Target group:

Finnish BSc students.

Prerequisites and co-requisites:

Matrix algebra, complex arithmetics, differential equations.

Recommended optional programme components:

Background to all analog electronics cources.

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:

-

462113S: Advanced topics on mechatronics and machine diagnostics, 5 - 10 op

Voimassaolo: 01.12.2016 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

ay462113S	Advanced topics on mechatronics and machine diagnostics (OPEN UNI)	5.0 op

Voidaan suorittaa useasti: Kyllä

Person responsible:

Toni Liedes

464105S: Computer aided design, 5 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Leikkaavuudet:

462044S-01	Computer Aided Design, examination	0.0 op
462044S-02	Computer Aided Design, exercise work	0.0 op
462044S	Computer Aided Design	3.5 op

ECTS Credits:

5 ects / 133 hours of studying work.

Language of instruction:

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

Timing:

Lectures and exercises arranged spring during periods 3. Recommended date of performance 4th year spring.

Learning outcomes:

After completing the course, the student will know modern CAD/CAE tools, simulation and virtual validation possibilities with CAD/CAE systems. The best procedures in various design tasks have also become familiar. In addition, the student is familiar with the theory behind CAD systems related to the geometry of models and their modification. In addition, the student also has a basis for product information management and the use of design data in PDM/PLM systems.

Contents:

The course includes product design and product validation on a computer-aided basis. During the course, you will get acquainted with the possibilities of product design and validation of functionality using CAD /CAE systems. Use of the computer in design functions and the applicable systems. Parametricity and customizability of the product play an important role. In addition,students learn what special tools design software offers.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 20 h/ exercises 30 h/ practical assignment 83 h. Exercises are carried out independently and the assignment in small groups.

Target group:

Master's Degree student of mechanical engineering, specially students studying Machine Design.

Prerequisites and co-requisites:

Machine Drawing and CAD, Design of Machine Elements.

Recommended optional programme components:

The course is an independent entity and does not require other studies to be completed at the same time.

Recommended or required reading:

e-Design Computer-Aided Engineering Design (Chang K-H., Elsevier, 2015)
In addition: Lee, K. Principles of CAD/CAM/CAE Systems, Addison-Wesley, Inc.: New York, 1999, 581 s.

Assessment methods and criteria:

Final exam, lecture exercises and exercise work. For the final grade, the exam has a weight factor of 0.4; for lecture exercises, 0.2; and for exercise work, 0.4.

Grading:

Numerical grading scale 1-5 / fail

Person responsible:

Jussi Salakka

464122A: Mobile hydraulics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jonne Untinen

Opintokohteen kielet: Finnish

Leikkaavuudet:

460076A	Mobile Hydraulics	3.5 op

ECTS Credits:

5 ects cr/ 133 hours of student's work

Language of instruction:

Finnish

Timing:

Lectures and exercises during periods 3.-4.

Learning outcomes:

The objective of the course is to provide the students with a general idea of the design and dimensioning of hydraulic systems used in mobile machines. Upon completion of the course, the student is able to describe the basic circuits and characteristics in mobile hydraulics. The student can also describe the most important components and operational preconditions of the mobile hydraulic system The student is able design simple mobile hydraulic systems. Furthermore, the student is able have discussions with the

experts in the field of mobile hydraulics using relevant terminology. The student is also capable of dimensioning the simple hydraulic drivetrain systems.

Contents:

Applications of hydraulic systems in mobile machines; Fundamentals of proportional- and hydraulic technique;. Components and their properties; Basics of design and dimensioning; Maintenance and safety of hydraulic systems. Basics of the digital valves and valve control systems.

Mode of delivery:

Distance-teaching.

Learning activities and teaching methods:

The course consists of distance-teaching 20 h, distance-guided exercises 20 h, exercise work and homework. 95 hours of independent studying.

Target group:

Mechannical Engineering Master's students.

Prerequisites and co-requisites:

462104A Machine automation, 462109S Machine modelling and simulation

Recommended or required reading:

Fonselius, J: Koneautomaatio: Hydrauliikka. 1995. Fonselius, J: Koneautomaatio: Servotekniikka. 1998. Mäkinen, R: Hydrauliikka II. 3rd ed. 1991. Louhos, P&J-P: Ajoneuvo- ja työkonehydrauliikat. 1992. Current publications in the field of mobile machines and hydraulics.

Assessment methods and criteria:

Final exam, The grade is determined by the sum of examination and exercises

Grading:

Numerical grading scale 1-5.

Person responsible:

Jonne Untinen

461107A: Finite Element Methods I, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Lumijärvi, Jouko Veikko Juhani

Opintokohteen kielet: Finnish

Leikkaavuudet:

461033A	Finite Element Methods I	3.5 op
461033A-01	Finite Element Methods I, examination	0.0 op
461033A-02	Finite Element Methods I, exercises	0.0 op

ECTS Credits:

5 ECTS credits / 132 hours of work

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. After this course, the student can explain the basic idea of the FEM. He/she can analyze simple truss-, frame- and plane structures and explain the theoretical background of the calculations.

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.-2.

Target group:

Students of the bachelor's stage of the Mechanical Engineering Degree Programme.

Prerequisites and co-requisites:

Strength of Materials I and II and Fundamentals of mechanical computing and programming

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:

The grade of the course is based on a final exam. The student must pass the exercises before taking the examination.

Grading:

Numerical grading scale 1-5.

Person responsible:

Jouko Lumijärvi

555343S: Product Data and product life cycle management, 5 op

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Erno Mustonen

Opintokohteen kielet: English

Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Period 3-4.

Learning outcomes:

The course familiarises students with the broad concepts of product data management (PDM) and product life cycle management (PLM). Upon completion of the course, the student will be able to:

- understand the basic terminology related to product, productisation, PDM and PLM

- analyse the current status of the productisation, product data structures, product life cycle management, commercial and technical product portfolios and related applications in case companies
- create strategic PDM and PLM concept based on the critical building blocks for one product data, product master data and product related business data
- model the company's HW, SW and Service product related commercial and technical product portfolios according to productisation concept
- understand the PDM and PLM processes including key roles such as concept owners, education and support roles, data owners, data users including the product data quality concept
- create and implement the governance model for PDM and PLM process and IT development as a part of company's business process development including PDM/PLM related information technology (IT) architecture for product master data and product related business data

Contents:

PDM and PLM strategic targets, productisation concept, commercial and technical product portfolios, PDM and PLM processes and tools, governance model and related IT applications and architecture

Mode of delivery:

The tuition will be implemented as face-to-face teaching, course readings and by a practical assignment which is a common with a course 555346S Product portfolio management.

Learning activities and teaching methods:

Face-to-face teaching 20 h (lectures), practical assignment (group work) and self-study 114 h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

555242 Product development

Recommended optional programme components:

555350S Research and technology management, 555351S Advanced course in product development, 555346S Product portfolio management

Recommended or required reading:

Lecture materials and selected articles.

Assessment methods and criteria:

Group work report (50 % of the grade) and exam (50 % of the grade).

Grading:

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

Person responsible:

D. Sc. Erno Mustonen

Working life cooperation:

The group work will be done in cooperation with case companies.

Other information:

Previous course name was 'Product Data Management'.

A460253: Supplementary Module, Engineering Mechanics, 20 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Supplementary Module
Laji: Study module
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

461117S: Engineering optimization, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Koivurova Hannu

Opintokohteen kielet: Finnish

Leikkaavuudet:

461023S Optimization of Structures 5.0 op

461023S-01 Optimization of Structures, examination 0.0 op

461023S-02 Optimization of Structures, exercises 0.0 op

ECTS Credits:

5 ECTS credits / 135 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the autumn semester, during periods I and II in every other year.

Learning outcomes:

The aim of this course is to familiarize students with the principles of optimization of structures and their applications in the design of machine parts, welded plate structures, trusses and frames. Upon completing the required coursework, the student knows the fundamental concepts of the optimization and recognizes the different mathematical definitions of the optimum, so called Kuhn Tuckers conditions. He/she is able to formulate the optimization problem mathematically and knows the most important solution methods for the linear and the nonlinear problem both in the constrained and unconstrained cases. The student knows the steps and the structure of the most widely used algorithms, the pros and cons of the different methods, and their suitability in the different problem types. He/she is able to use a commercial computer software for the application in the optimization of machine parts.

Contents:

Formulation of an optimization problem; Linear and non-linear optimization in the design of load-bearing structures; Computer software for optimization of structures; Optimization as a part of a computer aided design system.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 45 h / Computer exercise 30 h / Project work 15 h / Self-study 45 h.

Prerequisites and co-requisites:

Recommended: Element Methods I and II, and knowledge of Vector and Matrix Calculations.

Recommended optional programme components:

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

Recommended or required reading:

Arora, J. (2012) Introduction to Optimum Design. Elsevier, 3rd Edition. Oheiskirjallisuus: Arora, J. (2007) Optimization Of Structural And Mechanical Systems, World Scientific.; Kirsch, U. (1981) Optimus structural design. McGraw-Hill, 441s; Haftka, R., Gurdal, Z., Kamat, M. (1990) Elements of Structural Optimization. Kluwer, 396 s.

Assessment methods and criteria:

The final grade is based on the combined points from exercises and final exam.The assessment of the course is based on the learning outcomes of the course. The more detailed assessment criteria are available on the Moodle Study Portal.

Grading:

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

Person responsible:

University Lecturer Hannu Koivurova

461114S: Mechanics of composites, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Lahtinen, Hannu Tapio

Opintokohteen kielet: Finnish

Leikkaavuudet:

461027S-01	Mechanics of Composites	0.0 op
461027S-02	Mechanics of Composites	0.0 op
461027S	Mechanics of Composites	5.0 op

ECTS Credits:

5 ETCS / 120 hours of work

Language of instruction:

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

Timing:

The course is held in the autumn semester, during periods 1 and 2. It is recommended to complete the course at the 4th autumn semester.

Learning outcomes:

After the course, the student can use terminology of composite materials and their typical mechanical properties in the design of structures. He/she can explain how the elastic properties of anisotropic materials affect the mechanical behavior of laminated shells and plates and calculate stresses and strains of laminae and laminates. In addition, he/she is capable of analyzing bending, buckling and vibration problems of composite laminates by using the classical lamination theory and the finite element method.

Contents:

Terminology of composite materials. Elastic properties of anisotropic materials. Micro and macro mechanics of lamina. Macro mechanics of laminates. Bending, buckling and vibration of laminates. Principles of dimensioning of laminated structures.

Mode of delivery:

Implemented as Face-to-face -teaching

Learning activities and teaching methods:

Lectures 30 h / exercises 30 h / independent work of solving homework problems 60 h.

Target group:

For master degree students of mechanical engineering programme.

Prerequisites and co-requisites:

The recommended preceding courses are 461103A Strength of Materials I and 461104A Strength of Materials II.

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:

Jones, R.M., Mechanics of Composite Materials, McGraw-Hill, 1975; Tsai, Composite Design, Think Composites, 1987; Vinson & Sierakowski, The Behaviour of Structures Composed of Composite Materials, Martinus Nijhoff, 1986.

Assessment methods and criteria:

The course is passed by a final exam. An independent exercise work is required. Participation to the exam is allowed after the accepted exercise work.

Grading:

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

Person responsible:

University teacher Hannu Lahtinen

Other information:

The principals of micro and macro mechanical behaviour of composite materials and their application in analyses and design of composite structures.

031051S: Numerical Matrix Analysis, 5 op

Voimassaolo: 01.08.2012 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Applied Mathematics and Computational Mathematics

Arvostelu: 1 - 5, pass, fail

Opettajat: Marko Huhtanen

Opintokohteen kielet: Finnish

ECTS Credits:

5 ECTS credits / 135 hours of work

Language of instruction:

Finnish or English.
The course can be completed in English by intermediate exams or by a final exam.

Timing:

Fall semester, period 1

Learning outcomes:

After completing the course the student knows the most efficient and numerically stable methods to solve the basic problems in linear algebra. He/she knows the basic matrix factorizations and their approximations. The student has the capability to solve very large and sparse problems with the iterative solutions methods and understands the significance of preconditioning.

Contents:

Theory of matrix decompositions, SVD-decomposition, LU-decomposition, QR-decomposition, Schur-decomposition, FFT, eigenvalue- and generalized eigenvalue problems, matrix functions, GMRES, MINRES, Preconditioning.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h / Group work 14 h / Self-study 93 h.

Target group:

-

Prerequisites and co-requisites:

Completion of courses Calculus I and II, a course on Differential Equations and a Course on Linear Algebra and Numerical analysis

Recommended optional programme components:

-

Recommended or required reading:

Material posted on the web-page of the course.

Assessment methods and criteria:

Intermediate exams or a final exam.

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

Grading:

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

Person responsible:

Marko Huhtanen

Working life cooperation:

-

Other information:

-

462109S: Simulation and modelling of machines, 8 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Liedes, Toni Mikael

Opintokohteen kielet: Finnish

Leikkaavuudet:

462055S-01	Virtual Engineering of Mechatronic Products, examination	0.0 op
462055S-02	Virtual Engineering of Mechatronic Products, exercise work	0.0 op
462055S	Virtual Engineering of Mechatronic Products	5.0 op

ECTS Credits:

8 cr / 213 hours of work

Language of instruction:

Finnish

Timing:

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

Learning outcomes:

Upon completion of the course, the student will be able to create a simulation model consisting of rigid bodies using Adams and MATLAB/Simulink software. The student is able to interpret the simulation results and is also able to evaluate the validity of the results. The student is able to design submodels of complex systems and he/she is able to explain the principles of creating a more complex simulation model. In addition to this, the student is able to evaluate the extent of modelling process of various kinds of engineering systems.

Contents:

Basics of virtual design; ADAMS simulation software principles and basic usage; Creation and usage of multibody systems comprised of rigid bodies; Kinematic and dynamic analysis; Determination of actuator motion paths and velocities as well as determination of loads; Modelling and simulation of control systems.

Mode of delivery:

Blended teaching

Learning activities and teaching methods:

Lectures 32 h / Group work 32 h / Self-study 149 h

Target group:

Master's degree students of mechanical engineering

Prerequisites and co-requisites:

The recommended prerequisite is the completion of the following courses prior to enrolling for the course.

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 handout. Other material is in the beginning of the course.

Assessment methods and criteria:

This course utilizes continuous assessment. The assessment can be based on learning diary, exercises, seminars and exam. The more detailed assessment criteria are available on the Noppa Study Portal.

Grading:

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

Person responsible:

Lecturer Toni Liedes

462111S: Machine diagnostics, 10 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jouni Laurila

Opintokohteen kielet: Finnish

Leikkaavuudet:

464088S	Diagnosis of Machine Condition	8.0 op
464088S-01	Diagnosis of Machine Condition, examination	0.0 op
464088S-02	Diagnosis of Machine Condition, exercises	0.0 op

ECTS Credits:

10 ECTS credits / 270 hours of work

Language of instruction:

Finnish

Timing:

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

Learning outcomes:

After completing the course the student will be able to use various methods of machine diagnostics and use the most common measuring devices to determine the functioning and condition of machines. He / she is able to apply the key indicators and signal processing methods used in condition monitoring and to analyze the frequency content of signals in order to solve problems related to the operation of machines. They will be able to draw up a measurement plan, make measurements, analyze the data obtained and report the results obtained. He / she is also able to evaluate what factors affect the reliability and comparability of measurements. The student is able to use industry standards to help evaluate the condition of machinery and the vibration intensity. They will be able to understand the importance of machine diagnostics in the success and productivity of maintenance.

Contents:

Major methods and measurement techniques used in machine diagnostics, machine vibration analysis and fault detection, key signal processing methods, measurement design, implementation and reporting, machine balancing, industry standards.

Mode of delivery:

Face-to-face teaching

Target group:

Master's degree students in the mechanical engineering

Prerequisites and co-requisites:

The recommended prequisite is the completion of the following course: 462107A Maintenance of Machines, 462105A Sensor technology for Machines.

Recommended optional programme components:

The course is an independent entity.

Recommended or required reading:

Lecture handout and the other material delivered during the course. Supplementary readings: Mills, S.R. W., Vibration Monitoring & Analysis Handbook, BINDT, 2010. Mikkonen, H. (toim.), Kuntoon perustuva kunnossapito, KP-Media Oy, 2009. PSK-käsikirja 3: Kunnonvalvonnan värähtelymittaus, PSK Standardisointiyhdistys ry, 2019.

Assessment methods and criteria:

Final examination and the other graded assignments

Grading:

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

Person responsible:

Jouni Laurila

462112S: Measuring instruments in machine diagnostics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Konsta Antero Karioja

Opintokohteen kielet: Finnish

Leikkaavuudet:

464089S-01 Measuring Instrumentation and Techniques for Diagnosis of Machine Condition, examination 0.0 op

464089S-02 Measuring Instrumentation and Techniques for Diagnosis of Machine Condition, exercises 0.0 op

464089S Measuring Instrumentation and Techniques for Diagnosis of Machine Condition 5.0 op

ECTS Credits:

5 ECTS credits / 135 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the autumn semester, during period 1 and 2. It is recommended to complete the course at the 5th autumn semester.

Learning outcomes:

After completing the course, the student will be able to design, construct and calibrate the various measurement chains needed in machine diagnostics. They are able to use data loggers, analyzers, PC-based measurement systems, data acquisition cards and various filters, and other typical measuring instruments and know how they work, which is central to test diagnostics. The student also identifies the most important sources of error that affect the reliability and comparability of measurement results.

Contents:

Sensors and instrumentation for machine diagnostics, other equipment, design of measurement systems, evaluation and calibration of performance, and main signal processing methods in machine diagnostics.

Mode of delivery:

Face-to-face teaching

Target group:

Master's degree students in the mechanical engineering

Prerequisites and co-requisites:

The recommended prequisite is the completion of the following courses: 462105A Sensor technology for machines, 462107A Maintenance of Machines and 462111S Machine Diagnostics.

Recommended optional programme components:

The course is an independent entity.

Recommended or required reading:

Lecture handout and the other material delivered during the course. Supplementary readings: Mills, S.R. W., Vibration Monitoring & Analysis Handbook, BINDT, 2010. Mikkonen, H. (toim.), Kuntoon perustuva kunnossapito, KP-Media Oy, 2009. PSK-käsikirja 3 – Kunnonvalvonnan värähtelymittaus, PSK Standardisointiyhdistys ry, 2012.

Assessment methods and criteria:

Final examination and the other graded assignments

Grading:

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

Person responsible:

Konsta Karioja

465113S: Failure mechanisms in metals, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Nousiainen, Olli Pekka

Opintokohteen kielet: Finnish

Leikkaavuudet:

465079S	Failure Analysis	3.5 op

ECTS Credits:

5 ECTS/135 h study time

Language of instruction:

Finnish

Timing:

Spring semester, period 4. Recommended for fourth year of studies.

Learning outcomes:

After completion of the course, the student will be able to explain the effects of mechanical and environmental loads on the possible failure mechanisms in alloys. (S)he will be able to avoid unsuitable choices of materials in various applications. (S)he will be able to list the stages involved in a typical failure analysis. The student will be able to determine the most likely failure mechanism on the basis of the macroscopic and microscopic features of fracture surfaces. (S)he will be able to give rational instructions for avoiding failures.

Contents:

Failure mechanisms at low and high temperatures under static and dynamic loading. Failures caused by corrosion. Macroscopic and microscopic features of fracture surfaces. General principles and approaches to failure analysis. Failures induced by hydrogen. Practical examples of failure cases.

Mode of delivery:

Face to face

Learning activities and teaching methods:

Lectures 32 h / independent study 103 h.

Target group:

Compulsory in the masters stage for all Mechanical Engineering students majoring in Materials Engineering.

Prerequisites and co-requisites:

Before registering for this course the student must have successfully completed the following courses: 465101A An Introduction to Materials for Mechanical Engineering, 465102A Materials for Mechanical Engineering, 465105A Research techniques for materials, and 465107A An Introduction to Physical Metallurgy.

Recommended or required reading:

Study guide and lecture slides. Additional material: Wulpi, D.J.: Understanding How Components Fail, ASM 1985. Engel L. and Klingele H.: Atlas of Metals Damage, Carl Hauser Verlag.

Assessment methods and criteria:

Final grade assessed on the basis of final examination.

Grading:

Pass grades on a scale of 1-5. Grade 0 fail.

Person responsible:

Olli Nousiainen

465108S: Modelling of metal forming processes, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jari Larkiola

Opintokohteen kielet: Finnish

ECTS Credits:

5 / 135 h total study time

Language of instruction:

Finnish

Timing:

Autumn semester, periods I & II. Recommended for fourth study year.

Learning outcomes:

Students are initiated into physical models and computer aided modelling of metal forming processes. The object is to give students e.g. readiness of calculate forming forces during plastic deformations utilising simulation softwares.

Contents:

The course will cover traditional physical models related to various methods of shaping and shaping, as well as familiarize with computer-based simulation software (eg Abaqus and / or LS-Dyna). Temperature is an essential factor in hot working and the theory and modeling of heat transfer is one part of the course. In addition to the exam, the course includes assignments.

Mode of delivery:

Face to face

Learning activities and teaching methods:

Lectures 32h, experimental work 20h and independent study 83 h

Target group:

Compulsory in the masters stage for all Mechanical Engineering students majoring in Materials Engineering.

Prerequisites and co-requisites:

465103A Principles of metal shaping and forming

Recommended or required reading:

Lecture notes

Assessment methods and criteria:

Accepted examination (weighting 0.8) and experimental work (weighting 0.2).

Grading:

Examination scale 0-5 ja literature work 0-2. Grade 0 fail.

Person responsible:

Jari Larkiola

466105S: Design of Steel Structures, 6 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Kangaspuoskari, Matti Johannes
Opintokohteen kielet: Finnish
Leikkaavuudet:

485118S Design of Steel Structures 5.0 op
485108A Desing of Steel Structures and Steel Construction 5.0 op
ay466105S Design of Steel Structures (OPEN UNI) 6.0 op
460127S-01 Design of Steel Structures, examination 0.0 op
460127S-02 Design of Steel Structures, exercise work 0.0 op
460125A Introduction to Design of Steel Structures 4.0 op
460125A-01 Introduction to Design of Steel Structures, examination 0.0 op
460125A-02 Introduction to Design of Steel Structures, exercise work 0.0 op
460127S Design of Steel Structures 4.0 op

ECTS Credits:

6 ECTS

Language of instruction:

Finnish

Timing:

Periods 1 and 2
Course 485108A replaces this course in academic year 2021-2022.

Learning outcomes:

After completing the course the student is able to explain the basic nature of the crystalline structure of steel and its elastomeric material model. He / she is able to evaluate the effect of alloys, heat treatment and welding on the mechanical properties of steel. He / she can explain what happens to steel in the event of a fire and the basics of fire design. The student is able to design the joints of a steel structure frame and can dimension the steel structure under different load combinations. He / she is able to analyze stability problems and can explain inaccuracies and second order effects.

Contents:

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

Mode of delivery:

Face-to-face.

Learning activities and teaching methods:

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

Target group:

Degree students who study steel structure design.

Prerequisites and co-requisites:

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

Recommended or required reading:

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

Assessment methods and criteria:

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

Grading:

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

Person responsible:

Matti Kangaspuoskari

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

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Kangaspuoskari, Matti Johannes

Opintokohteen kielet: Finnish

Leikkaavuudet:

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

ECTS Credits:

6 ECTS

Language of instruction:

Finnish

Timing:

Periods 3 and 4

Learning outcomes:

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

Contents:

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

Mode of delivery:

Face-to-face.

Learning activities and teaching methods:

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

Target group:

Degree students who study steel structure design.

Prerequisites and co-requisites:

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

Recommended or required reading:

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

Assessment methods and criteria:

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

Grading:

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

Person responsible:

Matti Kangaspuoskari

031025A: Introduction to Optimization, 5 op

Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Applied Mathematics and Computational Mathematics
Arvostelu: 1 - 5, pass, fail
Opettajat: Ruotsalainen Keijo
Opintokohteen kielet: English

ECTS Credits:

5 ECTS credits / 135 hours of work

Language of instruction:

English

Timing:

The course is held in the autumn, during period 1.

Learning outcomes:

After completing the course the student is able to solve optimization convex optimization problems with the basic optimization algorithms. The student is also able to form the necessary and sufficient conditions for the optimality.

Contents:

Linear optimization, Simplex-algorithm, nonlinear optimization, KKT-conditions, duality, conjugate gradient method, penalty and barrier function methods.

Mode of delivery:

Face-to-face teaching

Learning activities and teaching methods:

Lectures 28 h / Group work 14 h / Self-study 93 h.
The course, Introduction to Optimization, will be lectured remotely through the ZOOM video conferencing tool. The more detailed instructions and access to ZOOM lectures can be found in the Moodle work space of the course. The link is here: https://moodle.oulu.fi/course/view.php?id=5350.

Target group:

Students in Wireless Communication Engineering

Prerequisites and co-requisites:

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

Recommended optional programme components:

-

Recommended or required reading:

P. Ciarlet; Introduction to numerical linear algebra and optimization, M. Bazaraa, H. Sherali, C.M. Shetty; Nonlinear programming

Assessment methods and criteria:

The course can be completed by a final exam.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

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

Person responsible:

Keijo Ruotsalainen

Working life cooperation:

-

Other information:

The course, Introduction to Optimization, will be lectured remotely through the ZOOM video conferencing tool. The more detailed instructions and access to ZOOM lectures can be found in the Moodle work space of the course. The link is here: https://moodle.oulu.fi/course/view.php?id=5350.

464107S: Machine design project, 10 op

Voimassaolo: 01.08.2015 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Niskanen, Juhani
Opintokohteen kielet: Finnish
Leikkaavuudet:

464058S	Project Work in Machine Design	8.5 op
464084S	Project Work in Paper Machinery Construction	8.5 op

ECTS Credits:

10 ects / 267 hours of studying work.

Language of instruction:

Finnish, can be completed in English as a book examination

Timing:

Work can be started during the lectures of the course Production Machine Design

Learning outcomes:

The aim of this course is to deepen the student's knowledge of constructions of production machines with the help of extensive exercise. Upon completion of the course, the student has realized a demanding research, development or design project from a topic given by the industry. After completion of the course, the student is able to analyze, develop or improve existing machine components or processes.

Contents:

Carrying out a wide industry based product development, research or design project.

Mode of delivery:

Individual project work.

Learning activities and teaching methods:

Project work is done in groups of 1 to 4 students depending on the size and requirements of the work.

Target group:

Master's degree students of mechanical engineering or process engineering

Prerequisites and co-requisites:

Machine Design or/and Production Machine Design

Recommended optional programme components:

Production Machine Design

Recommended or required reading:

Supplied according to needs

Assessment methods and criteria:

Accepted project work

Grading:

Numerical grading scale 1-5 / fail

Person responsible:

professor Juhani Niskanen

461118S: Advanced topics on engineering mechanics, 5 - 10 op

Voimassaolo: 01.12.2016 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Koivurova Hannu
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

A460255: Supplementary Module, Production Technology, 20 op

Voimassaolo: 01.08.2005 -
Opiskelumuoto: Supplementary Module
Laji: Study module
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

Ei opintojaksokuvauksia.

e3

555286A: Process and quality management, 5 op

Voimassaolo: 01.01.2014 -
Opiskelumuoto: Intermediate Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Osmo Kauppila
Opintokohteen kielet: Finnish
Leikkaavuudet:

ay555286A	Process and quality management (OPEN UNI)	5.0 op
555281A	Basic Course of Quality Management	5.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish.

Timing:

Period 4.

Learning outcomes:

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

- explain the role of process and quality management in a business organisation
- develop business processes based on the principles of quality management and appropriate tool

Contents:

Foundations of total quality management, planning of quality, performance measurement, process management, people management in relation to quality management, implantation of total quality management.

Mode of delivery:

The tuition will be implemented as face-to-face teaching (integrated classroom lectures and exercises).

Learning activities and teaching methods:

20 h lectures, 114 h independent study

Target group:

Industrial Engineering and Management students and other students studying Industrial Engineering and Management as minor.

Prerequisites and co-requisites:

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Recommended optional programme components:

This course is part of the 25 ECTS module of Industrial engineering and management that also includes 555225P Basics of industrial engineering and management, 555285A Project management, 555242A Product development, and 555264P Managing well-being and quality of working life.

Recommended or required reading:

Oakland, J.S. (2014) Total quality management and operational excellence (4th ed.). Routledge, 529 pp. and material handed out during the course.

Assessment methods and criteria:

To pass the course, the student must pass the weekly course exercises (50 % of the course grade) and an exam (50 %).

Grading:

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

Person responsible:

University lecturer Osmo Kauppila.

Working life cooperation:

No.

Other information:

Substitutes course 555281A Basic Course of Quality Management.

555330S: Sourcing Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Leikkaavuudet:

555323S Sourcing Management 3.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish. English material will also be used.

Timing:

Period 2

Learning outcomes:

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

- understand the overall concept of sourcing management
- know the key concepts of sourcing and purchase management and can explain these
- describe the structures of sourcing and purchasing organisations and can explain the meaning of sourcing management in the performance of operations
- analyse the purchasing activities in a company and can produce improvement proposals based on the analysis
- take part in the sourcing 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:

The tuition will be implemented as blended teaching (face-to-face teaching and a supervised group work).

Learning activities and teaching methods:

Face-to-face teaching 20 hrs (lectures/ assignment guidance 14 hrs, final seminar 6 hrs) group work 114 hrs.

Target group:

Industrial Engineering Management students.

Prerequisites and co-requisites:

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

Recommended optional programme components:

-

Recommended or required reading:

Lecture notes. Other material will be defined at the beginning of the course

Assessment methods and criteria:

The assessment is based on the group work.

Grading:

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

Person responsible:

Adjunct professor Jukka Majava

Working life cooperation:

The group work is done in cooperation with case companies.

Other information:

Substitutes course 555323S Sourcing Management.

555331S: Advanced Supply Chain Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: Finnish

Leikkaavuudet:

555324S Advanced Supply Chain Management 3.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

Finnish. English material is also used.

Timing:

Periods 3-4.

Learning outcomes:

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

- describe supply chain and supply chain management concepts and strategies, as well as understand the importance of effective supply chain management
- develop and analyse supply networks and create development proposals to improve productivity and competitiveness
- undestand the importance of risk management in supply networks
- know the importance of sustainability and social responsibility and the opportunities of digitalisation in supply network development

Contents:

supply chain and supply chain management concepts and processes, supply chain strategies, performance measurement, supply network development, risk management and resilience, demand and supply planning and coordination, inventory management, transportation, information systems, social responsibility and sustainable development

Mode of delivery:

The tuition will be implemented as blended teaching (web-based teaching and face-to-face teaching).

Learning activities and teaching methods:

Face-to-face teaching 16 h (lectures/ group work presentations 12 h, exercises 4 h), group work 64 h, self-study 54 h

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

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

Recommended optional programme components:

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Recommended or required reading:

Sakki, J. (2014) Tilaus-toimitusketjun hallinta. Jouni Sakki Oy. Other materials will be provided at the beginning of the course

Assessment methods and criteria:

The grade will be based on the group work (60 % of the grade) and book examination (40 % of the grade).

Grading:

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

Person responsible:

Associate professor Jukka Majava

Working life cooperation:

Case organisations' supply chain related data is utilised in the group works.

Other information:

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555333S: Production Management, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Industrial Engineering and Management

Arvostelu: 1 - 5, pass, fail

Opettajat: Jukka Majava

Opintokohteen kielet: English

Leikkaavuudet:

555322S Production Management 3.0 op

ECTS Credits:

5 ECTS credits.

Language of instruction:

English

Timing:

Periods 1-2.

Learning outcomes:

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

- understand the key concepts of operations and production management
- know the essential production strategies
- understand the principles of the supply chain management, and should be able to apply JIT, Lean and TOC methods in analysing and constructing development plans for production organisations
- apply the management methods also in service systems
- understand the principles of the sustainable development in production

Contents:

Production strategies, sustainable development, Supply Chain Management, Just-In-Time (JIT), Theory of Constraints (TOC), Lean, Toyota Production System (TPS), management of the production of services.

Mode of delivery:

The tuition will be implemented as blended teaching (face-to-face teaching and a supervised group work).

Learning activities and teaching methods:

Face-to-face teaching 26 hrs (lectures/assignment guidance 20 hrs, final seminar 6 hrs), group work 108 hrs.

Target group:

Industrial Engineering and Management and Master’s Programme in Product Management students.

Prerequisites and co-requisites:

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

Recommended optional programme components:

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Recommended or required reading:

Liker J (2004) The Toyota Way: 14 Management Principles from the World's Greatest Manufacturer. Goldratt, E. M. (2012) The Goal: A Process of Ongoing Improvement. Material delivered during the lectures.

Assessment methods and criteria:

The assessment is based on the group work.

Grading:

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

Person responsible:

Adjunct professor Jukka Majava

Working life cooperation:

The group work is done in cooperation with case companies.

Other information:

Substitutes course 555322S Production Management.

555343S: Product Data and product life cycle management, 5 op

Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Industrial Engineering and Management
Arvostelu: 1 - 5, pass, fail
Opettajat: Erno Mustonen
Opintokohteen kielet: English
Voidaan suorittaa useasti: Kyllä

ECTS Credits:

5 ECTS credits.

Language of instruction:

English.

Timing:

Period 3-4.

Learning outcomes:

The course familiarises students with the broad concepts of product data management (PDM) and product life cycle management (PLM). Upon completion of the course, the student will be able to:

- understand the basic terminology related to product, productisation, PDM and PLM
- analyse the current status of the productisation, product data structures, product life cycle management, commercial and technical product portfolios and related applications in case companies
- create strategic PDM and PLM concept based on the critical building blocks for one product data, product master data and product related business data
- model the company's HW, SW and Service product related commercial and technical product portfolios according to productisation concept
- understand the PDM and PLM processes including key roles such as concept owners, education and support roles, data owners, data users including the product data quality concept
- create and implement the governance model for PDM and PLM process and IT development as a part of company's business process development including PDM/PLM related information technology (IT) architecture for product master data and product related business data

Contents:

PDM and PLM strategic targets, productisation concept, commercial and technical product portfolios, PDM and PLM processes and tools, governance model and related IT applications and architecture

Mode of delivery:

The tuition will be implemented as face-to-face teaching, course readings and by a practical assignment which is a common with a course 555346S Product portfolio management.

Learning activities and teaching methods:

Face-to-face teaching 20 h (lectures), practical assignment (group work) and self-study 114 h.

Target group:

Industrial Engineering and Management students.

Prerequisites and co-requisites:

555242 Product development

Recommended optional programme components:

555350S Research and technology management, 555351S Advanced course in product development, 555346S Product portfolio management

Recommended or required reading:

Lecture materials and selected articles.

Assessment methods and criteria:

Group work report (50 % of the grade) and exam (50 % of the grade).

Grading:

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

Person responsible:

D. Sc. Erno Mustonen

Working life cooperation:

The group work will be done in cooperation with case companies.

Other information:

Previous course name was 'Product Data Management'.

462111S: Machine diagnostics, 10 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Jouni Laurila

Opintokohteen kielet: Finnish

Leikkaavuudet:

464088S	Diagnosis of Machine Condition	8.0 op
464088S-01	Diagnosis of Machine Condition, examination	0.0 op
464088S-02	Diagnosis of Machine Condition, exercises	0.0 op

ECTS Credits:

10 ECTS credits / 270 hours of work

Language of instruction:

Finnish

Timing:

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

Learning outcomes:

After completing the course the student will be able to use various methods of machine diagnostics and use the most common measuring devices to determine the functioning and condition of machines. He / she is able to apply the key indicators and signal processing methods used in condition monitoring and to analyze the frequency content of signals in order to solve problems related to the operation of machines. They will be able to draw up a measurement plan, make measurements, analyze the data obtained and report the results obtained. He / she is also able to evaluate what factors affect the reliability and comparability of measurements. The student is able to use industry standards to help evaluate the condition of machinery and the vibration intensity. They will be able to understand the importance of machine diagnostics in the success and productivity of maintenance.

Contents:

Major methods and measurement techniques used in machine diagnostics, machine vibration analysis and fault detection, key signal processing methods, measurement design, implementation and reporting, machine balancing, industry standards.

Mode of delivery:

Face-to-face teaching

Target group:

Master's degree students in the mechanical engineering

Prerequisites and co-requisites:

The recommended prequisite is the completion of the following course: 462107A Maintenance of Machines, 462105A Sensor technology for Machines.

Recommended optional programme components:

The course is an independent entity.

Recommended or required reading:

Lecture handout and the other material delivered during the course. Supplementary readings: Mills, S.R. W., Vibration Monitoring & Analysis Handbook, BINDT, 2010. Mikkonen, H. (toim.), Kuntoon perustuva kunnossapito, KP-Media Oy, 2009. PSK-käsikirja 3: Kunnonvalvonnan värähtelymittaus, PSK Standardisointiyhdistys ry, 2019.

Assessment methods and criteria:

Final examination and the other graded assignments

Grading:

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

Person responsible:

Jouni Laurila

462112S: Measuring instruments in machine diagnostics, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Konsta Antero Karioja

Opintokohteen kielet: Finnish

Leikkaavuudet:

464089S-01 Measuring Instrumentation and Techniques for Diagnosis of Machine Condition, examination 0.0 op

464089S-02 Measuring Instrumentation and Techniques for Diagnosis of Machine Condition, exercises 0.0 op

464089S Measuring Instrumentation and Techniques for Diagnosis of Machine Condition 5.0 op

ECTS Credits:

5 ECTS credits / 135 hours of work

Language of instruction:

Finnish

Timing:

The course is held in the autumn semester, during period 1 and 2. It is recommended to complete the course at the 5th autumn semester.

Learning outcomes:

After completing the course, the student will be able to design, construct and calibrate the various measurement chains needed in machine diagnostics. They are able to use data loggers, analyzers, PC-based measurement systems, data acquisition cards and various filters, and other typical measuring instruments and know how they work, which is central to test diagnostics. The student also identifies the most important sources of error that affect the reliability and comparability of measurement results.

Contents:

Sensors and instrumentation for machine diagnostics, other equipment, design of measurement systems, evaluation and calibration of performance, and main signal processing methods in machine diagnostics.

Mode of delivery:

Face-to-face teaching

Target group:

Master's degree students in the mechanical engineering

Prerequisites and co-requisites:

The recommended prequisite is the completion of the following courses: 462105A Sensor technology for machines, 462107A Maintenance of Machines and 462111S Machine Diagnostics.

Recommended optional programme components:

The course is an independent entity.

Recommended or required reading:

Lecture handout and the other material delivered during the course. Supplementary readings: Mills, S.R. W., Vibration Monitoring & Analysis Handbook, BINDT, 2010. Mikkonen, H. (toim.), Kuntoon perustuva kunnossapito, KP-Media Oy, 2009. PSK-käsikirja 3 – Kunnonvalvonnan värähtelymittaus, PSK Standardisointiyhdistys ry, 2012.

Assessment methods and criteria:

Final examination and the other graded assignments

Grading:

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

Person responsible:

Konsta Karioja

464103A: Machine design, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Niskanen, Juhani

Opintokohteen kielet: Finnish

Leikkaavuudet:

464056A	Machine Design II	6.0 op
464056A-01	Machine Design II, examination	0.0 op
464056A-02	Design II, exercise	0.0 op
464062S	Engineering Design	20.0 op

ECTS Credits:

5 ects / 133 hours of studying work.

Language of instruction:

Finnish, can be completed in English as a book examination

Timing:

Lectures spring period 3 and 4.

Learning outcomes:

Upon completion of this course, the student is able, asa 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. Student is also able to design new product or essentially improve old product. Student knows what is required when working as a part of a product development project.

Contents:

Advanced machine design, design of assemplies and design methods. Utilization of Automation and new materials. Meaning of a machine directive.

Mode of delivery:

Face-to-face teaching.

Learning activities and teaching methods:

Lectures 40 h / practical work 93 h.

Target group:

3rd year mechanical engineering students

Prerequisites and co-requisites:

Design of machine elements, Engineering drawing and CAD.

Recommended optional programme components:

The course of study is an independent entity and does not require other studies to be completed simultaneously.

Recommended or required reading:

Björk, T.& al. Koneenosien suunnittelu. WSOY, Porvoo, 2014; Shigley, J. E. ja Mischke, C. R. Mechanical Engineering Design. New York, McGraw-Hill,1983. Tuomaala, J. Koneensuunnitteluoppi, first part. Oulu, 1995. Tuomaala, J. : Koneensuunnitteluoppi, later part, Oulu, 1995. Dieter, G.E. : Engineering Design, McGraw-Hill: New York, 2000.

Assessment methods and criteria:

Final Exam and practical work. Final exam is 50% and practical work 50% of final grade

Grading:

Numerical grading scale 1-5 / fail

Person responsible:

Professor Juhani Niskanen

462106A: Precision engineering, 5 op

Voimassaolo: 01.08.2015 -

Opiskelumuoto: Intermediate Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opettajat: Louhisalmi, Yrjö Aulis

Opintokohteen kielet: English

Leikkaavuudet:

462038A-01	Precision Engineering, examination	0.0 op
462038A-02	Precision Engineering, exercise work	0.0 op
462038A	Precision Engineering	3.5 op

ECTS Credits:

5 cr / 133 hours of work

Language of instruction:

English

Timing:

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

Learning outcomes:

Upon completion of the course, the student can analyze structures and components used in precise engineering products, can explain working principles of them and can design new qualified and easily manufactured precise engineering products.

Contents:

Introduction, design of precision mechanical devices, enclosure and usability of devices, fixed and removable joints, implementation of rotary and linear motion, and the most common precision and micromechanical manufacturing methods.

Mode of delivery:

Blended teaching. The course is lectured in English, possible exercises are taught face to face. Final exam in English.

Learning activities and teaching methods:

Lectures 28 h / group working 15 h / independent studying 90 h

Target group:

Bachelor's Degree students in Mechatronics and machine diagnostics and Master's degree students of Mechanical engineering.

Recommended optional programme components:

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). Additional literature: Krause, W.: Grundlagen der konstruktion, elektronik, elektrotechnik, feinwerktechnik, 7 aufl., Hanser, 1994; Ullman, D.: The mechanical design process, 3. ed., Mac-Graw-Hill, 2003.

Assessment methods and criteria:

The course uses continuous assessment. The overall grade may be determined, for example, by the weighted average of the learning diary, homework, assignments, seminars, and exam.

Grading:

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

Person responsible:

University teacher Yrjö Louhisalmi

463110S: Advanced topics on manufacturing technology, 5 - 10 op

Voimassaolo: 01.12.2016 -
Opiskelumuoto: Advanced Studies
Laji: Course
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opettajat: Jari Larkiola
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

A400080: Master's Thesis and Maturity Test, 30 op

Voimassaolo: 01.08.2007 -
Opiskelumuoto: Master's Thesis and Maturity Test
Laji: Study module
Vastuuyksikkö: Faculty of Technology
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish
Voidaan suorittaa useasti: Kyllä

Ei opintojaksokuvauksia.

Alternative

469097S: Master's Thesis in Automotive Engineering, 30 op

Opiskelumuoto: Advanced Studies
Laji: Diploma thesis
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

ECTS Credits:

30 ECTS

Language of instruction:

Finnish or English

Timing:

Recommended timing the spring term of the 2nd year of the master level.

Learning outcomes:

Upon completion of the thesis the student recognizes practical problems, she/he be able to create a research plan and research questions. She/He is able to plan the project and manage her/his own work according to the timetable. Student controlls different kind of research methods and be able to apply skills learned during master's studies to solving asked research questions. She/he understand practical meanings of solutions, limited and know if there is some useful outputs. The student can also utilize different information sources and critically evaluate the information obtained. The student is able to produce clear and finalized text, in line with technical and scientific writing practices.

Contents:

The student defines the contents of his / her work, consulting the supervisor of the Master's thesis. The Chief of degree programme accepts the contents, the subject and the topic of the thesis work.

Mode of delivery:

Individual work. The diploma thesis completes the master's degree studies.

Learning activities and teaching methods:

The Master's thesis work is supervised by a staff member of the Faculty and doing with industrial company.

Target group:

Mechanical Engineering Master's students

Prerequisites and co-requisites:

Master's level studies of Degree programme.

Assessment methods and criteria:

The thesis work is made independently by the student as planned. The thesis work is saved digitally and reviewed through the University of Oulu Laturi electronic thesis (E-thesis) submission system. Final written report will evaluate.

Grading:

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

Person responsible:

Thesis' supervisor

Working life cooperation:

Working in or with the industrial company.

469091S: Master's Thesis in Machine Design, 30 op

Opiskelumuoto: Advanced Studies
Laji: Diploma thesis
Vastuuyksikkö: Field of Mechanical Engineering
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: Finnish

ECTS Credits:

30 ECTS

Language of instruction:

Finnish/English

Timing:

Recommended timing the spring term of the 2nd year of the master level.

Learning outcomes:

Upon completion of the thesis the student recognizes practical problems, she/he be able to create a research plan and research questions. She/He is able to plan the project and manage her/his own work according to the timetable. Student controlls different kind of research methods and be able to apply skills learned during master's studies to solving asked research questions. She/he understand practical meanings of solutions, limited and know if there is some useful outputs. The student can also utilize different information sources and critically evaluate the information obtained. The student is able to produce clear and finalized text, in line with technical and scientific writing practices.

Contents:

The student defines the contents of his / her work, consulting the supervisor of the Master's thesis. The Chief of degree programme accepts the contents, the subject and the topic of the thesis work.

Mode of delivery:

Individual work. The diploma thesis completes the master's degree studies.

Learning activities and teaching methods:

The Master's thesis work is supervised by a staff member of the Faculty and doing with industrial company.

Target group:

Mechanical Engineering Master's students

Prerequisites and co-requisites:

Master's level studies of Degree programme.

Assessment methods and criteria:

The thesis work is made independently by the student as planned. The thesis work is saved digitally and reviewed through the University of Oulu Laturi electronic thesis (E-thesis) submission system. Final written report will evaluate.

Grading:

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

Person responsible:

Thesis' supervisor

Working life cooperation:

Working in or with the industrial company.

469092S: Master's Thesis in Materials Engineering, 30 op

Opiskelumuoto: Advanced Studies

Laji: Diploma thesis

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

30 ECTS

Language of instruction:

Finnish or English

Timing:

Recommended timing the spring term of the 2nd year of the master level.

Learning outcomes:

Upon completion of the thesis the student recognizes practical problems, she/he be able to create a research plan and research questions. She/He is able to plan the project and manage her/his own work according to the timetable. Student controlls different kind of research methods and be able to apply skills learned during master's studies to solving asked research questions. She/he understand practical meanings of solutions, limited and know if there is some useful outputs. The student can also utilize different information sources and critically evaluate the information obtained. The student is able to produce clear and finalized text, in line with technical and scientific writing practices.

Contents:

The student defines the contents of his / her work, consulting the supervisor of the Master's thesis. The Chief of degree programme accepts the contents, the subject and the topic of the thesis work.

Mode of delivery:

Individual work. The diploma thesis completes the master's degree studies.

Learning activities and teaching methods:

The Master's thesis work is supervised by a staff member of the Faculty and doing with industrial company.

Target group:

Mechanical Engineering Master's students

Prerequisites and co-requisites:

Master's level studies of Degree programme.

Assessment methods and criteria:

The thesis work is made independently by the student as planned. The thesis work is saved digitally and reviewed through the University of Oulu Laturi electronic thesis (E-thesis) submission system. Final written report will evaluate.

Grading:

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

Person responsible:

Thesis' supervisor

Working life cooperation:

Working in or with the industrial company.

469098S: Master's Thesis in Mechatronics and Machine Diagnostics, 30 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Advanced Studies

Laji: Diploma thesis

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

30 ECTS

Language of instruction:

Finnish/English

Timing:

Recommended timing the spring term of the 2nd year of the master level.

Learning outcomes:

Upon completion of the thesis the student recognizes practical problems, she/he be able to create a research plan and research questions. She/He is able to plan the project and manage her/his own work according to the timetable. Student controlls different kind of research methods and be able to apply skills learned during master's studies to solving asked research questions. She/he understand practical meanings of solutions, limited and know if there is some useful outputs. The student can also utilize different information sources and critically evaluate the information obtained. The student is able to produce clear and finalized text, in line with technical and scientific writing practices.

Contents:

The student defines the contents of his / her work, consulting the supervisor of the Master's thesis. The Chief of degree programme accepts the contents, the subject and the topic of the thesis work.

Mode of delivery:

Individual work. The diploma thesis completes the master's degree studies.

Learning activities and teaching methods:

The Master's thesis work is supervised by a staff member of the Faculty and doing with industrial company.

Target group:

Mechanical Engineering Master's students

Prerequisites and co-requisites:

Master's level studies of Degree programme.

Assessment methods and criteria:

The thesis work is made independently by the student as planned. The thesis work is saved digitally and reviewed through the University of Oulu Laturi electronic thesis (E-thesis) submission system. Final written report will evaluate.

Grading:

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

Person responsible:

Thesis' supervisor

Working life cooperation:

Working in or with the industrial company.

469099S: Master's Thesis in Structural Engineering and Construction Technology, 30 op

Voimassaolo: 01.08.2005 -

Opiskelumuoto: Advanced Studies

Laji: Diploma thesis

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

30 ECTS

Language of instruction:

Finnish/English

Timing:

Recommended timing the spring term of the 2nd year of the master level.

Learning outcomes:

Upon completion of the thesis the student recognizes practical problems, she/he be able to create a research plan and research questions. She/He is able to plan the project and manage her/his own work according to the timetable. Student controlls different kind of research methods and be able to apply skills learned during master's studies to solving asked research questions. She/he understand practical meanings of solutions, limited and know if there is some useful outputs. The student can also utilize different information sources and critically evaluate the information obtained. The student is able to produce clear and finalized text, in line with technical and scientific writing practices.

Contents:

The student defines the contents of his / her work, consulting the supervisor of the Master's thesis. The Chief of degree programme accepts the contents, the subject and the topic of the thesis work.

Mode of delivery:

Individual work. The diploma thesis completes the master's degree studies.

Learning activities and teaching methods:

The Master's thesis work is supervised by a staff member of the Faculty and doing with industrial company.

Target group:

Mechanical Engineering Master's students

Prerequisites and co-requisites:

Master's level studies of Degree programme.

Assessment methods and criteria:

The thesis work is made independently by the student as planned. The thesis work is saved digitally and reviewed through the University of Oulu Laturi electronic thesis (E-thesis) submission system. Final written report will evaluate.

Grading:

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

Person responsible:

Thesis' supervisor

Working life cooperation:

Working in or with the industrial company.

469095S: Master's Thesis in Engineering Mechanics, 30 op

Opiskelumuoto: Advanced Studies

Laji: Diploma thesis

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

30 ECTS

Language of instruction:

Finnish/English

Timing:

Recommended timing the spring term of the 2nd year of the master level.

Learning outcomes:

Upon completion of the thesis the student recognizes practical problems, she/he be able to create a research plan and research questions. She/He is able to plan the project and manage her/his own work according to the timetable. Student controlls different kind of research methods and be able to apply skills learned during master's studies to solving asked research questions. She/he understand practical meanings of solutions, limited and know if there is some useful outputs. The student can also utilize different information sources and critically evaluate the information obtained. The student is able to produce clear and finalized text, in line with technical and scientific writing practices.

Contents:

The student defines the contents of his / her work, consulting the supervisor of the Master's thesis. The Chief of degree programme accepts the contents, the subject and the topic of the thesis work.

Mode of delivery:

Individual work. The diploma thesis completes the master's degree studies.

Learning activities and teaching methods:

The Master's thesis work is supervised by a staff member of the Faculty and doing with industrial company.

Target group:

Mechanical Engineering Master's students

Prerequisites and co-requisites:

Master's level studies of Degree programme.

Assessment methods and criteria:

The thesis work is made independently by the student as planned. The thesis work is saved digitally and reviewed through the University of Oulu Laturi electronic thesis (E-thesis) submission system. Final written report will evaluate.

Grading:

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

Person responsible:

Thesis' supervisor

Working life cooperation:

Working in or with the industrial company.

469093S: Master's Thesis in Industrial Engineering, 30 op

Opiskelumuoto: Advanced Studies

Laji: Diploma thesis

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

30 ECTS

Language of instruction:

Finnish/English

Timing:

Recommended timing the spring term of the 2nd year of the master level.

Learning outcomes:

Upon completion of the thesis the student recognizes practical problems, she/he be able to create a research plan and research questions. She/He is able to plan the project and manage her/his own work according to the timetable. Student controlls different kind of research methods and be able to apply skills learned during master's studies to solving asked research questions. She/he understand practical meanings of solutions, limited and know if there is some useful outputs. The student can also utilize different information sources and critically evaluate the information obtained. The student is able to produce clear and finalized text, in line with technical and scientific writing practices.

Contents:

The student defines the contents of his / her work, consulting the supervisor of the Master's thesis. The Chief of degree programme accepts the contents, the subject and the topic of the thesis work.

Mode of delivery:

Individual work. The diploma thesis completes the master's degree studies.

Learning activities and teaching methods:

The Master's thesis work is supervised by a staff member of the Faculty and doing with industrial company.

Target group:

Mechanical Engineering Master's students

Prerequisites and co-requisites:

Master's level studies of Degree programme.

Assessment methods and criteria:

The thesis work is made independently by the student as planned. The thesis work is saved digitally and reviewed through the University of Oulu Laturi electronic thesis (E-thesis) submission system. Final written report will evaluate.

Grading:

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

Person responsible:

Thesis' supervisor

Working life cooperation:

Working in or with the industrial company.

469094S: Master's Thesis in Production Technology, 30 op

Opiskelumuoto: Advanced Studies

Laji: Diploma thesis

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

30 ECTS

Language of instruction:

Finnish/English

Timing:

Recommended timing the spring term of the 2nd year of the master level.

Learning outcomes:

Upon completion of the thesis the student recognizes practical problems, she/he be able to create a research plan and research questions. She/He is able to plan the project and manage her/his own work according to the timetable. Student controlls different kind of research methods and be able to apply skills learned during master's studies to solving asked research questions. She/he understand practical meanings of solutions, limited and know if there is some useful outputs. The student can also utilize different information sources and critically evaluate the information obtained. The student is able to produce clear and finalized text, in line with technical and scientific writing practices.

Contents:

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Mode of delivery:

Individual work. The diploma thesis completes the master's degree studies.

Learning activities and teaching methods:

The Master's thesis work is supervised by a staff member of the Faculty and doing with industrial company.

Target group:

Mechanical Engineering Master's students

Prerequisites and co-requisites:

Master's level studies of Degree programme.

Assessment methods and criteria:

The thesis work is made independently by the student as planned. The thesis work is saved digitally and reviewed through the University of Oulu Laturi electronic thesis (E-thesis) submission system. Final written report will evaluate.

Grading:

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

Person responsible:

Thesis' supervisor

Working life cooperation:

Working in or with the industrial company.

Compulsory

469090S: The Maturity Test for MasterŽs Degree, 0 op

Voimassaolo: 01.08.2009 -

Opiskelumuoto: Advanced Studies

Laji: Course

Vastuuyksikkö: Field of Mechanical Engineering

Arvostelu: 1 - 5, pass, fail

Opintokohteen kielet: Finnish

ECTS Credits:

0 ECTS

Language of instruction:

Finnish, Swedish or English.

Timing:

After completion of the master's thesis.

Learning outcomes:

The student can produce text in popular form of the research field and thus show ones familiarity to the field.

Contents:

Depends on the topic of the thesis.

Mode of delivery:

Literary work.

Learning activities and teaching methods:

Exam.

Target group:

Master Students of Mechanical Engineering

Assessment methods and criteria:

Student writes an essay about the topic of the Master's thesis to show a good command of the content of the thesis

Grading:

Pass or fail

Person responsible:

Supervisor of Thesis

Tutkintorakenteisiin kuulumattomien opintokokonaisuuksien ja -jaksojen kuvaukset

902141Y: Oral Fluency, 2 op

Voimassaolo: 01.08.2014 -
Opiskelumuoto: Language and Communication Studies
Laji: Course
Vastuuyksikkö: Languages and Communication
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: English

Proficiency level:
CEFR Level: B2 (Lower - Average)
Status:
This course can be chosen in partial completion of the English language requirement for students in the engineering programmes in the Faculty of Technology (TTK) and the Faculty of Information Technology and Electrical Engineering (TST).
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:
2 credits. The workload is 53 hours
Language of instruction:
English

Timing:
The course takes place in both autumn (periods 1 and 2) and spring (periods 3 and 4) semesters. Check the study guide for availability in your department.
Learning outcomes:
Learning outcomes - By the end of the course, you are expected to:
1. demonstrated oral fluency for dealing with a wide variety of work-related and social situations,
2. demonstrated an ability to express your own thoughts and opinions in paired or small group discussions,
3. demonstrated understanding of others' contributions in paired or small group discussions,
4. initiated self-directed language learning strategies, including personal goal-setting and self-evaluation, to help you learn effectively in future.
Contents:
Designed for students with weaker self-confidence as English-speakers, this course aims to facilitate the development of oral fluency. The lessons offer extensive speaking practice in pairs and small groups, activating passive knowledge of vocabulary and structure, and helping you gain confidence in your English speaking and listening skills.
This module offers a comfortable environment in which to practice speaking over a wide range of different oral communication activities, including simulations, role-play, improvised or guided situational dialogue, and free conversation. You will also develop your English communication skills and language learning strategies through self-directed homework activities, on which you will report regularly in class, as well as in a final written report at the end of the semester.
Mode of delivery:
Contact teaching and independent study
Learning activities and teaching methods:
Lessons 26 hours. Active participation is essential.
Independent work 27 hours.
Target group:
Students in the engineering programmes (TTK and TST)
Prerequisites and co-requisites:
-
Recommended optional programme components:
This is an elective course which can be taken after 902150Y PET by students in the engineering programmes (TTK, TST and OMS).
Recommended or required reading:
Course materials will be provided by the teacher in electronic form.
Assessment methods and criteria:
Continuous assessment will be based on on the learning outcomes of the course, as demonstrated in a) active participation in oral activities in class and b) the quality of the written homework.
Read more about assessment criteria at the University of Oulu webpage.
Grading:
Pass/Fail
Person responsible:
Susan McAnsh - See contact teachers

Working life cooperation:
-
Other information:
-

ay724106P: Principles of Marketing (OPEN UNI), 5 op

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

724106P	Principles of Marketing	5.0 op

Voidaan suorittaa useasti: Kyllä

902150Y: Professional English for Technology, 2 op

Voimassaolo: 01.08.2014 -
Opiskelumuoto: Language and Communication Studies
Laji: Course
Vastuuyksikkö: Languages and Communication
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: English
Leikkaavuudet:

902011P-05 TE3/ Professional English for Technology 2.0 op

Proficiency level:
CEFR B2 - C1
Status:
This course is the first English course for students in the engineering programmes in the Faculty of Technology (TTK) and Faculty of Information Technology and Electrical Engineering (TST).
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:
2 credits. The workload is 53 hours.
Language of instruction:
English
Timing:
The course takes place in the autumn semester (periods 1 and 2).
Learning outcomes:
By the end of the course, you can
- create and deliver effective presentations of a product, a company and company processes,
- apply appropriate cultural, linguistic and technical knowledge when presenting a product or company,
- evaluate your own strengths and weaknesses in English-language communication, with a view to developing appropriate skills in future.

Contents:
Scheduled as the first course of your English studies, Professional English for Technology (PET) has a strong focus on developing speaking skills necessary for working life. During PET, you will explore a product or service from your own field, and give a variety of short presentations in connection with your product or service. In addition, PET helps you to develop an awareness of your own language skills, encouraging you to develop strategies and techniques for effective learning.
Mode of delivery:
Contact teaching and independent study
Learning activities and teaching methods:
Lessons 24 hours / independent work 29 hours. Lessons include regular pair and group work in class. Independent homework activities include team work for the preparation of four short presentations, vocabulary study and other small assignments. Active participation is essential.
Target group:
Students in the engineering programmes: TTK (PO1, YMP1, KO1, TuTa1, RaKy), TST (ST2, CSE2).
Prerequisites and co-requisites:
-
Recommended optional programme components:
This course is offered as the first course of your English studies.
Recommended or required reading:
Course materials will be provided by the teacher in electronic form.
Assessment methods and criteria:
The course utilises continuous assessment that is based on the learning outcomes of the course, including full and active participation in class, and the successful completion of module assignments and class presentations.

Lue lisää opintosuoritusten arvostelusta yliopiston verkkosivulta.
Grading:
pass / fail
Person responsible:
Each engineering programme has its own Languages and Communication contact teacher for questions about English studies.

Working life cooperation:
-
Other information:
-

902145Y: Working Life Skills, 2 op

Opiskelumuoto: Language and Communication Studies
Laji: Course
Vastuuyksikkö: Languages and Communication
Arvostelu: 1 - 5, pass, fail
Opintokohteen kielet: English

Proficiency level:
CEFR B2 - C1
(Alla levels)
Status:
This course can be chosen in partial completion of the English language requirement for students in the engineering programmes in the Faculty of Technology (TTK) and Faculty of Information Technology and Electrical Engineering (TST).
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 teachers for your department to discuss individual solutions.
ECTS Credits:
2 ECTS credits. The workload is 53 hours.
Language of instruction:
English
Timing:
The course takes place in both autumn (periods 1 and 2) and spring (periods 3 and 4) semesters. Check the study guide for availability in your department.
Learning outcomes:
By the end of the course, you are expected to
1. have demonstrated a good basic vocabulary related to job applications, meetings and negotiations,
2. have demonstrated an ability to create an effective CV and cover letter for a job application,
3. be able to communicate effectively and with a reasonable degree of fluency at job interviews and in meeting and negotiation contexts.

Contents:
The aim of this course is to help you to develop the English language skills needed to deal with situations related to everyday working life. The course focuses on four basic areas:
i) business communication
ii) social and cultural aspects of English in working life situations,
iii) applying for a job,
iv) a general introduction to the language of meetings and negotiations.
Mode of delivery:
Contact teaching and independent study
Learning activities and teaching methods:
Lessons 26 hours / independent work 27 hours. Active participation is essential. The course includes regular pair and group work in class and independent homework activities.
Target group:
Students in the engineering programmes (TTK and TST).
Prerequisites and co-requisites:
-
Recommended optional programme components:

This is an elective course which can be taken after 902150Y PET by students in the engineering programmes (TTK and TST).

Recommended or required reading:

Course materials will be provided by the teacher in electronic form.

Assessment methods and criteria:

The course utilises continuous assessment that is based on the learning outcomes of the course. In addition, full and active participation is required, course assignments must be completed, and students must achieve a grade of 70% in two tests during the course. Students will be asked to take an end-of course exam if they have not otherwise demonstrated that they have achieved the learning outcomes by the end of the course.
Read more about assessment criteria at the University of Oulu webpage.

Grading:

Pass/fail

Person responsible:

Susan McAnsh

Working life cooperation:

-

Other information:

See contact teachers, https://www.oulu.fi/kielikoulutus/node/56574.)