Opasraportti

FTech - Courses in English for exchange students, Field of Mechanical Engineering (2017 - 2018)

Courses in English for Exchange Students in the study field of Mechanical Engineering during the Academic Year 2017-18 at the Faculty of Technology, University of Oulu

NB! Course availability: The listed courses are available for **exchange students hosted by the Faculty of Technology / study field Mechanical Engineering, if they have the previous knowledge requirements** of the course.

Exchange students hosted by other University of Oulu faculties usually cannot take these courses, especially if they do not have the required previous knowledge. They must contact the Liaison of the Faculty of Technology to ask if it is possible to participate.

The courses either have their lecture materials (books, notes, exams, etc). available in English or are taught in English: Most of the Mechanical Engineering courses are lectured in Finnish, but there is an alternative method for completing the course in English: e.g. a book exam (the course has reading materials (self-study materials: books, lecture notes, etc.) are available in English; these materials replace the lectures; and possible practical exercises and final exam are taught/givnen in English.

When preparing your study plan for your application, use the information provided under the **Courses** tab in this catalogue. **Read carefully** the information of each course you wish to take (language of instruction, target group, contents, timing, preceding studies, additional information etc.).

For information on the **exchange application process** please see www.oulu.fi/university/studentexchange. All exchange applicants must **submit their exchange application through SoleMOVE** by the deadline given, proposed study plan (Learning Agreement signed by you and your home university) is attached to the on-line application.

Accepted exchange students are **required to register to all courses**. Course registration takes place once you have received your University of Oulu login information close to the start of your exchange period. When registering you will be able to find detailed information on teaching and schedule here under **Instruction and Examinations** tabs.

Schedules are **periodical**: Courses organised during **periods 1-2** are given on the **autumn** term (September-December), and respectively **periods 3-4** refer to courses given during the **spring** term (January-May).

Teaching periods for 2017-18

Autumn term 2017
Period 1: Sept 4 - Oct 27, 2017
Period 2: Oct 30 – Dec 22, 2017 (after period 2 there might be some exams until the end of January)

Spring term 2018
Period 3: Jan 8 – March 9, 2018
Period 4: March 12 – May 11, 2018 (after period 4 there might be some exams until the end of May)

For arrival and orientation dates see www.oulu.fi/university/studentexchange/academic-calender

Any questions about these courses should be addressed to:

Ms. M.Sc. Marita Puikkonen
Liaison for Faculty of Technology Student Exchange (Incoming & Outgoing Mobility) in
Process, Environmental and Mechanical Engineering, and Industrial Engineering and Management and Chemistry
Faculty of Technology, University of Oulu, Finland
Eddress: Study.Technology@oulu.fi

Further information on application process and services for incoming exchange students
www.oulu.fi/university/studentexchange or at International.Office@oulu.fi

Tutkintorakenteisiin kuulumattomat opintokokonaisuudet ja -jaksot

462110S: Advanced course in mechatronics, 8 op
464105S: Computer aided design, 5 op
465113S: Failure mechanisms in metals, 5 op
462101A: Information technology and machines, 5 op
462105A: Machine Sensor Technology, 5 op
462104A: Machine automation, 5 op
462111S: Machine diagnostics, 10 op
462107A: Maintenance of machines, 5 op
462112S: Measuring instruments in machine diagnostics, 5 op
462108S: Mechatronics, 6 op
462106A: Precision engineering, 5 op
465103A: Principles of metal shaping and forming, 5 op
465112S: Sheet metal forming, 8 op
462109S: Simulation and modelling of machines, 8 op
465110S: Strength of metallic alloys, 7 op

Opintojaksojen kuvaukset

Tutkintorakenteisiin kuulumattomien opintokokonaisuuksien ja -jaksojen kuvaukset

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

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

Opettajat: Tapio Korpela

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.
Learning outcomes:
The aim of the course is to teach for students how the computer systems are used in different fields of mechanical machine design. After the course, the student is able to define whatcomputer systems belong to the customer

centered computer integrated manufacturing. He/she is able to explain what design knowledge is produced in these systems and what design knowledge is transferred between these systems. The student is able to use the CAD/CAM system used in the course in different fields of mechanical machine design.
Contents:
The course will focus on the use of computer systems in different fields of mechanical machine design. The emphasis is on the utilization of product data and the realization of product based design systems, where there is often a need to integrate many systems functionally together
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 20 h / exercises 30 h / practical work 83 h
Target group:
4th year master degree student of mechanical engineering.
Prerequisites and co-requisites:
Machine Drawing and CAD, Design of Machine Elements.
Recommended or required reading:
Lee, K. Principles of CAD/CAM/CAE Systems, Addison-Wesley, Inc.: New York, 1999, 581 s.
Assessment methods and criteria:
Final exam and practical work. Final exam will be 40% and practical work 60% of final grade.
Grading:
: Numerical grading scale 1-5 / fail
Person responsible:
University Lecturer Tapio Korpela

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. (S)he will be able to plan tests to measure fatigue and creep resistance.
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. Practical examples of failure cases. Fatigue and creep testing.
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, 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:
Professor Jukka Kömi

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. 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

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. 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

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.
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
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 notes. 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:
University teacher Yrjö Louhisalmi

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 / 267 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 is capable to utilize the different methods of the machine diagnostics and use the most common measuring devices in the finding out the operation and condition of machines. He/she is able to apply the most important features and signal processing methods which are used in the condition monitoring and he/she can analyse the frequency contents of signals to clarify the problems which are related to the operation of machines. The student is able to draw up a measurement plan, carry out the measurements and report the obtained results. The student can use the standards of this field as help in the evaluation of the condition of machines and severity of vibrations. He/she is able to perceive what kind of significance the machine diagnostics has to the success of the maintenance and productivity.
Contents:
The most important methods and measuring techniques which are used in the machine diagnostics, the analysis of machine vibration and faults diagnosis, the most important signal processing methods, measurement planning, realisation and reporting, dynamic balancing of machines, standards of this field
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
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:
Jouni Laurila

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 / 133 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:
Upon completion of the course, the student knows the different types of maintenance execution and can introduce what kind of points are connected to the choice of the maintenance strategy. The student knows the most common machine failure modes and consequences of them and can tell how the failures can be prevented. The student will recognize the effects of wearing and lubrication on the condition of machines and he/she is capable of explaining the basic concepts related to analysis of lubricants. The student knows the basics of the vibration measurement which are used in the condition monitoring of machines and can choose the suitable measuring and analysis methods for the identification of the most common machine faults. The student is familiar with the significance of maintenance in the productional operation and he/she is able to apply the most important standards of the maintenance field.
Contents:
Maintenance strategies and organizing methods, standards of this field, failure modes, wearing and lubrication, basics and the most general methods of machine condition monitoring
Mode of delivery:
Face-to-face teaching
Learning activities and teaching methods:
Lectures 24 h / group work 36 h / self-study 75 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:
Lecture handout and the other material delivered during the course. Supplementary readings: Järviö, J. et al., Kunnossapito. Helsinki, KP-Media Oy / Kunnossapitoyhdistys ry 2007. 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

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 / 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 5th autumn semester.

Learning outcomes:

Upon completion of the course, the student is able to design, build and calibrate different types of measurement sequences which are needed in machine diagnostics. He/she knows how to use data recorders, analyzers, PC-based measuring systems, data acquisition boards and filters as well as other typical measuring devices and is able to explain their operating principles. The student is also able to recognize typical sources of errors which can influence the reliability of the measuring results.

Contents:

Sensors and other devices which are used in the machine diagnostics, planning, functional evaluation and calibration of the measuring instruments and systems

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: 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.

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

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, Housing and usability of devices, permanent and detachable joints, bearing and guidance design and on precise 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:
The couse consists of lectures and an exercise work and a final exam.
Target group:
Master's degree students of mechanical engineering
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:
Final exam. The grade of the course is based on a final examination. The student must pass the exercise work before taking the examination.

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

Person responsible:
University teacher Yrjö Louhisalmi

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 I & II. Recommended for third study year.

Learning outcomes:
The object is to get students to understand the fundamentals of theory of plasticity. After course, student should have a readiness to apply theory of plasticity to metal forming analyses and to solve the simple stress distributions based on external loads.

Contents:
During course, common constitutive material models for different metals are examined. Processing methods effecting to the microstructure like rolling, forging, extrusion and wire drawing are included in course as like the sheet metal forming processes. In addition, e.g. the information from tensile tests is combined to the theory of plasticity and constitutive material models.

Mode of delivery:
Face to face

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 (weighting 0.8) and literature work (weighting 0.2).

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

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

Ei opintojaksokuvauksia.

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: Louhisalmi, Yrjö Aulis
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

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: Jukka Kömi

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