SCHOOL OF ENGINEERING / BACHELORS DEGREE IN ENGINEERING

- Mechanical and Production Engineering Degree Programme
- Construction Engineering Degree Programme
- Information Technology Degree Programme

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DEGREE PROGRAMMES IN MECHANICAL AND PRODUCTION ENGINEERING, CONSTRUCTION ENGINEERING AND INFORMATION TECHNOLOGY

The above degree programmes lead to a Bachelors Degree Qualification in Engineering with graduates entitled to use the title 'Engineer' (University of Applied Sciences). The Bachelors Degree in Engineering is worth 240 cr and takes about 4 years to complete.

GENERAL OBJECTIVES

The general objectives of the degree programmes are:

1) to provide knowledge on the structures of the devices, systems and procedures and how they work for each Engineering Major and also different planning, design, implementation and maintenance methods.
2) to develop students' skills in applying knowledge and skills acquired from their studies so that they will be able to work with initiative, independently and in co-operation with others after a short period of work experience.
3) to provide basic knowledge of production economics, human resources, international co-operation and environmental protection required in marketing, administration and management posts.
4) to provide students with the competence and skills to continue their education on post graduate courses and within complimentary education.

The degree programmes furnishes students with skills for control and maintenance planning, leadership, and expert posts as well as business and entrepreneurial activities. The degree should also create a technological overview on which graduate engineers can base their decisions and take responsibility taking into account the demands made by economics, labour, environmental protection, saving energy and society.

SPECIAL INFORMATION

The School of Engineering organises differentiated courses in Maths, English and Physics for first year students based on their previous level of achievement in these subjects. These courses cover the theory of indispensable mathematical tools and they include practical Maths and Physics exercises. The English courses provide the competence to make use of available engineering literature.

Special training provided by the armed forces has been approved for accreditation as part of free-choice studies where appropriate.

MECHANICAL AND PRODUCTION ENGINEERING

This degree programme focuses on industrial means of production, machines and processes. It provides the basis for planning, use, quality and material management posts in industry. The programme emphasises practice and it furnishes students with in depth knowledge of production processes management from the beginning to the finished product.

The courses and studies covered during this degree programme are supported by design and planning software for product planning to virtual modelling as well as automation, production and testing laboratories with their versatile machines and equipment, providing an environment for practical implementation and practice.

Degree Programme Specific Competences

Production Engineering Degree Programme	Description of Competence
Basic skills in mechanical engineering	• ability to use maths and physics to describe mechanical phenomena and to solve problems • knowledge of the most common components and machine parts used in mechanical engineering and how the most common machines work • knowledge of basic mechanical measurements • knowledge of principles of energy technology and use
Planning and design competence	• knowledge of basic technical documentation and use of 3D modelling in design and planning • knowledge of the most common structural materials and their features of use • understanding of the significance of standardisation in product planning and production • ability to take into account the whole life-cycle of the product during the planning stage • comprehension of the significance of group

	work in product planning and the competence to work as a member of an international planning organisation
Manufacturing technology competence	• knowledge of manufacturing engineering methods, equipment and opportunities • understanding of the principles of production systems and automation and its effect on product structure • knowledge of the principles of logistics
Machine safety competence	• knowledge of the demands in product planning resulting from mechanical directives and regulations • ability to plan safe and user-friendly devices and structures
Business competence	• knowledge of the requirements of profitable business operations • ability to carry out simple investment calculations
Mathematics and scientific competence	• ability to use mathematics and physics to solve problems • ability to work systematically and logically • knowledge of the effects of the laws of nature on the functioning of equipment and structures
Automation competence	• knowledge of the basic systems of machine automation, components and equipment • ability to plan and construct automated structures
Production competence	• knowledge of basic industrial production operations • ability to plan and control production • knowledge of the main production methods, equipment and systems for the manufacturing industry

THEMES FOR EACH YEAR OF STUDY:

1st yr

Acquisition of basic engineering competence

Students will gain an overview of the most important areas of mechanical and production engineering that are involved in all manufacturing activities and will be able to acquire knowledge and skills to control such areas.

2nd yr

Deeper knowledge for automation competence

This theme covers learning how to make production more efficient and usability and reliability technologies in order to achieve profitable production as well as the development of communication and social interaction skills.

3rd yr

Specialised production competence

This theme includes the acquisition of specialist skills and competence in a specific field and an expansion of knowledge to enable graduates to control and develop production.

4th yr

Finalising engineering competence

Application of skills and knowledge in practice and a broadening of horizons at work

DEGREE PROGRAMME IN MECHANICAL AND PRODUCTION ENGINEERING

BASIC STUDIES	**51 cr**
GENERAL STUDIES	**30 cr**
Mathematics	12 cr
Physics	12 cr
Industrial Chemistry	3 cr
Introduction to Data Processing	3 cr
LANGUAGE AND COMMUNICATION STUDIES	**9 cr**
Finnish Language and Communication	3 cr
Text and Terminology	3 cr
Svenska för Maskin- och produktionsingenjörer	3 cr
BUSINESS ADMINISTRATION	**12 cr**
Introduction to Business Economics	3 cr
Corporate Law	3 cr
Leadership and Occupational Psychology	3 cr
Marketing and Customer Relationships	3 cr
COMPULSORY PROFESSIONAL STUDIES	**99 cr**

English Language and Communication Studies	3 cr
Design Technology	16 cr
Production Engineering	27 cr
Mechanical Engineering	16 cr
Electrical Engineering	6 cr
Automation Technology	31 cr

OPTIONAL PROFESSIONAL STUDIES	**30 cr**
Extractive Technology	15 cr
Machine Planning	15 cr
Maintenance	15 cr
Numerically Controlled Production	15 cr
Production Management	15 cr
Virtual Production	15 cr

FREE-CHOICE STUDIES	**15 cr**
PRACTICAL TRAINING (autumn of 4th yr)	**30 cr**
THESIS	**15 cr**

COURSE DESCRIPTIONS FOR THE DEGREE PROGRAMME IN MECHANICAL AND PRODUCTION ENGINEERING

BASIC STUDIES

(TKPY0Z) BASIC STUDIES 30 cr

This module provides basic skills in mathematical and natural science subjects for engineering and data handling.

(TKPY010) Algebra and Geometry

Credits: 6 cr Timing: 1st yr

Learning Objectives: To review and supplement the main principles of high school and vocational college mathematics

Contents:
Sets of numbers and calculations
Functions
Trigonometry
Vectors
Determinants and matrixes
Introduction to a mathematics programme

Learning Methods: Lectures and exercises. Individual and group work

Assessment Methods: To be announced

Bibliography:
Majaniemi, A., Algebra I
Majaniemi, A., Algebra II
Majaniemi, A., Geometria
Henttonen, J., Peltomäki, J., Uusitalo, S., Tekniikan matematiikka

(TKPY011) Introduction to Differential and Integral Calculus

Credits: 3 cr Timing: 2nd yr

Learning Objectives: Students will understand how differential and integral calculus can be used to examine simple functions and to calculate surface areas.

Contents:
Review of basic algebra calculations
Derivate and function growth rate
Examination of function graphs
Extreme values
The concept of integrals and surface area

Learning Methods: Lectures and exercises. Individual and group work

Assessment Methods: To be announced in the course plan and at the beginning of the course.

Bibliography: Majaniemi, A., Matematiikka I

(TKPY012) Probability and Statistics

Credits: 3 cr Timing: 2nd yr

Learning Objectives: Students will know the basic principles of probability calculation and simple statistical distributions for use in engineering.

Contents: Probability calculation
Basic statistical concepts

Learning Methods: Lectures and exercises. Individual and group work

Assessment Methods: To be announced in the course plan and at the beginning of the course.

Bibliography: Majaniemi, A., Matematiikka IV
Henttonen, J., Peltomäki, J., Uusitalo, S., Tekniikan matematiikka 2

(TKPY013) Physics 1

Credits: 5 cr Timing: 1st yr

Learning Objectives: Students will be competent in physics required in other courses organised in the school of engineering.

Contents: Quantities and unit systems of physics
Motion theory, motion power theory
Work, power and energy
Linear momentum and quantity of motion
Circular and spinning motion
The mechanics of fluids and gases
Thermology

Learning Methods: Lectures and exercises

Assessment Methods: 2 - 3 interims exams

Bibliography: Inkinen, P., Tuohi, J., Momentti 1, Insinöörifysiikka

(TKPY014) Physics 2

Credits: 4 cr Timing: 2nd yr

Learning Objectives: Students will know the physical background required in other courses in the school of engineering.

Previous Learning: Physics 1

Contents: Electronics and the theory of magnetism
Wave motion and acoustics

Learning Methods: Lectures and exercises

Assessment Methods: Interim exams

Bibliography: Inkinen,P. ,Tuohi,J., Momentti 2 Insinöörifysiikka, Otava

(TKPY005) Physics, Laboratory Work

Credits: 3 cr Timing: 2nd yr

Learning Objectives: Students will become conversant with basic physics through experimentation. The course also covers measurement technology and written reporting.

Contents: Completion of laboratory work and written reporting

Learning Methods: laboratory exercises

Assessment Methods: Completion of laboratory work and written reports (assessment 1 - 5)

Bibliography: Inkinen, P., Tuohi, J., Momentti 1 Insinöörifysiikka , Otava
Inkinen, P., Manninen, R., Tuohi, J., Momentti 2 Insinöörifysiikka , Otava

(TKPY006) Industrial Chemistry

Credits: 3 cr Timing: 3rd yr

Learning Objectives: Students will gain a proficiency in chemistry enabling them to understand chemical reactions and rules and chemical processes in industry.

Contents: Chemical elements and periodic table
Quantity of material (mass) and concentration
Chemical equations and energy
Acids and alkalis and the PH values of their solutions
Electrolysis as a method of producing and coating metals
Corrosion and its prevention
Dangerous materials and their safety regulations

Learning Methods: Lectures and exercises

Assessment Methods: To be announced

Bibliography: Arvonen, A., Levonen, H., Ammattikorkeakoulun kemia
Antila, A., Karppinen, M., Leskelä, M.,
Mölsä, H., Pohjakallio, M.,
Tekniikan kemia
Handouts

(TKPY007) Introduction to Data Processing

Credits: 3 cr Timing: 1st yr

Learning Objectives: Students will be conversant with the basics of information technology and security. They will know how to use Kajaanin UAS computers, their peripehral devices and their most common tools programmes and software for study purposes.

Contents: Basic IT
The UAS data system
Directory structure
Information security
Word processing
Presentation graphics

Spreadsheet calculation
Occupational health and environment

Learning Methods: Lectures and online studies

Assessment Methods: Exam and exercises within online learning environment

Bibliography: Reading list/material provided by lecturer

(TKPK1Z) LANGUAGE AND COMMUNICATION SKILLS 9 cr

This module develops and strengthens communication skills so that students will be able to cope in different professional communication situations.

(TKPK001) Communication Skills in Finnish

Credits: 3 cr Timing: 1st yr

Learning Objectives: Students will practise the different spoken and written tasks required in their profession.

Contents: An introduction to spoken and written communication
Academic writing
Spoken situations (preparation, participation and analysis)

Learning Methods: Independent work, group work, complimentary lectures

Assessment Methods: Participation in group work

Bibliography: Kauppinen, A., Nummi, J., Savola, T., Tekniikan viestintä (10., uudistettu painos)
Handout

(TKPK007) Basics of Engineering English

Credits: 1.5 cr Timing: 1st yr

Learning Objectives: Mechanical and Production Engineering students will be able to read professional texts related to their field of studies and write technical documents.

Previous Learning: Proficiency test and Build up Your English course if required

Contents: Technical English as a tool
The special grammatical features of technical English

Learning Methods: Contact teaching, exercises, independent study, pair and group work

Assessment Methods: Active participation, exercises; written exam

Bibliography: Course handout

(TKPK008) Advanced Engineering English

Credits: 1.5 cr Timing: 2nd yr

Learning Objectives: Mechanical and Production Engineering students will be able to read professional technical literature, write technical documents and search for and process information concerning their field of studies.

Contents: Special grammatical features of technical language
Building of vocabulary for own engineering field
Development of reading techniques
Documentation practice
Spoken and written reporting and summarizing

Learning Methods: Contact teaching, independent work, pair and group work

Assessment Methods: Active participation, searching for technical texts, processing and oral presentations

Bibliography: Students' processed texts

(TKPK004) Swedish for Mechanical and Production Engineers

Credits: 3 cr Timing: 3rd yr

Learning Objectives: Students will develop their oral and writing skills in Finland's second offcial language specifically to aid their own professional development. Students will practise speaking Swedish in everyday communication situations as well as being able to discuss professional issues in Swedish. Students will also be able to find and use information in Swedish concerning their own specific field.

Contents: Central vocabulary and communication situations for mechanical and production engineering students

Learning Methods: Small group teaching

Assessment Methods: Active participation, spoken and written exercises, written exam

Bibliography: Ledtråd till teknisk svenska: Maskin- Bil- El- Elektronik- IT

(TKPH2Z) BUSINESS ECONOMICS 12 cr

The aim of the course is to provide an in depth introduction to business operations and the domestic economy as well as to strengthen internal entrepreneurship.

(TKPH001) Business Economics, Basics

Credits: 3 cr Timing: 1st yr

Learning Objectives: Students will be conversant with the principles of business operations will gain an overview of business planning.

Contents: Basic concepts of business operations
Internal and external entrepreneurship
Functional processes and operational environment
Financing and profitability control
Profit margin and investment calculation
Business planning.

Learning Methods: lectures and exercises

Assessment Methods: Exam and business plan

Bibliography: Kinkki, Isokangas, Yrityksen perustoiminnot, WSOY 2004

(TKPH002) Corporate Law

Credits: 3 cr Timing: 4th yr

Learning Objectives: Students will be proficient in the general principles of contract law and they will be aware of the central agreements and liability related to business activity.

Contents: The legal system
Contracts and making contracts
Forms of business
Contract of employment, working time and holidays
Commercial agreements
Compensation

Learning Methods: Online and blended studies

Assessment Methods: Exam and assignments

Bibliography: To be announced

(TKPH003) Management and Leadership

Credits: 3 cr Timing: 3rd yr

Learning Objectives: This course covers administrative and leadership tasks, different management cultures and humans as a resource within an organisation.

Contents: Administration and leadership in an organisation
Leadership theory
Individual and group behaviour in a working community
Organisation theory
Professional ethics

Learning Methods: Lectures, course-work

Assessment Methods: Exam or portfolio

Bibliography: Joutsenkunnas, T., Heikurainen, P., Esimiehenä palveluyrityksessä
Further reading on professional ethics

(TKPH004) Marketing and Customer Relationships

Credits: 3 cr Timing: 4th yr

Learning Objectives: Students will gain a general overview of customer oriented marketing, sales and service concepts and content as well as PR and publicity.

Previous Learning: Introduction to Business Economics

Contents:
Basic concepts of marketing and marketing thinking
Selecting and segmenting target groups
Customer oriented marketing and PR
Long-term relations and goal driven operations
Image marketing
Competitive strategy in marketing
Personal sales
Marketing strategy

Learning Methods: Lectures and course-work

Assessment Methods: Exam and assignments

Bibliography:
Lahtinen, Isoviita, Asiakaspalvelu ja markkinointi
Handout

PROFESSIONAL STUDIES

(TKAE0Z) ENGLISH LANGUAGE AND COMMUNICATION STUDIES 3 cr

(TKAE004) Intercultural Skills in Engineering

Credits: 1.5 cr Timing: 2nd yr

Learning Objectives: Mechanical and Production Engineering students will develop their intercultural communication competence so that they can recognise cultural differences, understand them and adjust their communication style as the situation requires.

Contents:
Concepts of culture and communication
Variables used to compare cultures
Cultural differences in communication
The process of adjusting to an unfamiliar culture

Learning Methods: Contact teaching, exercises, independent work, pair and group work

Assessment Methods: Active participation, project work and oral presentation

Bibliography: Course handout

(TKAE005) Business English for Engineering

Credits: 1.5 cr Timing: 3rd yr

Learning Objectives: Mechanical and Production engineering students will apply their intercultural communication competence and deepen their ability to perform in written and spoken interaction situations using English within international and multicultural working life.

Contents:
Company, production and product presentation
Telephone conversations
Written communication

Meetings and negotiations

Learning Methods: Contact teaching, exercises, independent work, pair and group work

Assessment Methods: Active participation, spoken and written exercises

Bibliography: Course handout

(TKAS0Z) DESIGN TECHNOLOGY 15 cr

students will be conversant with the principles of technical drawing, modern product development methods and the use of computers in Design technology.

(TKAS001) Technical Drawing

Credits: 3 cr Timing: 1st yr

Learning Objectives: Students will be able to read and make technical and assembly drawings for machine construction and draft and draw technical drawings of simple parts and of the assembly of small constructions.

Contents: Standards and their significance
Lines and text
Projections and axonometry
Drafting
Cross sections
Dimensions and tolerances
Use of field specific symbols, schematic diagrams and special notations.

Learning Methods: Lectures, exercises

Assessment Methods: Exam, assignments and attendance

Bibliography: Valtanen, E Tekniikan taulukkokirja 18. painos tai uudempi
Material also provided by lecturer

(TKAS002) Computer Aided Design

Credits: 3 cr Timing: 1st yr

Learning Objectives: Students will be conversant with CAD software in 2 dimensional design and the opportunities of computer aided design.

Contents: CAD systems and their features
Basic drawing functions and commands
Edit functions
Design measurement
Symbols and their use
Printing drawings

Learning Methods: Small group teaching and course-work

Assessment Methods: Course assignments and a practical test (assessment 1 - 5)

Bibliography: Autocadin perusteet pdf-tiedostona
Further reading list/material provided by lecturer

(TKAS003) 3D Modelling (CAD)

Credits: 6 cr Timing: 2nd yr

Learning Objectives: Students will be able to use 3-D applications for product modelling purposes.

Previous Learning: An Introduction to Data Processing Computer Aided Design

Contents: An introduction to 3-dimensional modelling
Using a graphic work station
Visualisation
Producing drawings
Compositions
Features modelling
Sheet metal products

Learning Methods: Lectures and course-work. Programmes in use Autocad, Inventor and Solidworks

Assessment Methods: Exam (assessment 1 - 5) 50 % coursework (assessment 1 - 5) 50 %

Bibliography: McFarlane, B., Introducticing 3D AutoCAD
Kautonen, H., Manner, J., Muotoja Cadilla, Edita
Laakko, T., Tuotteen 3D-CAD -suunnittelu, WSOY
Further reading list/material provided by lecturer

(TKAS007) Project/Laboratory Work, Design Technology (PDM)

Credits: 3 cr Timing: 3rd yr

Learning Objectives: Students will gain practical experience of planning and design and problems encountered during the design process while at the same time learning to apply previously acquired theoretical knowledge.

Contents: Practical research and/or design tasks linked to design and product development studies.

Learning Methods: The course will be accomplished by participating in the English-taught Product Development course (KBW025), where it will be possible to achieve either 3 or 6 credits. The course forms a part of RDI studies.

Assessment Methods: Participation in collaborative project and completing all agreed tasks therein

Bibliography: Students will search for their project/lab material using different sources of information.

(TKAC2Z) PRODUCTION TECHNOLOGY 31 cr

(TKAC012) Manufacturing Technology

Credits: 4 cr Timing: 1st yr

Learning Objectives: Students will gain a general overview of how manufacturing units are made and which devices and machines are used for this purpose.

Contents:
Casting technique
Moulding techniques
Sheet and coupling techniques
Machine cutting
Coating metods

Learning Methods: Lectures and course-work

Assessment Methods: Exam and assignments

Bibliography: Ihalainen, E., Aaltonen, K., Aromäki, M., Sihvonen, P., Valmistustekniikka
Further reading/material provided by lecturer

(TKAC008) Introduction to NC-Technology

Credits: 3 cr Timing: 2nd yr

Learning Objectives: Students will gain a general overview of the opportunities provided by NC technology in production and will be able to create effective NC programmes for basic machine tools.

Contents:
NC machines and their structures
The use and function of NC machines
NC programming
NC machinery in its own environment
The maintenance and servicing of NC machinery

Learning Methods: Lectures, exercises and labs

Assessment Methods: Exam (evaluation 1 - 5) 80 % and participation (20 %)

Bibliography: Pikkarainen, E., Mustonen M., Numeerisesti ohjatut työstökoneet

(TKAC014) The Basics of Computer Aided NC Programming

Credits: 3 cr Timing: 2nd yr

Learning Objectives: Students will know how to use CAD 3D applications and to programme machining paths based on generated geometry in order to produce NC programmes for numerically controlled machining tools.

Previous Learning: Introduction to NC Technology Computer-aided Design (3D Modelling)

Contents:
Stages of computer aided NC programming
Transfer of data from the design system to the NC programming system
Creating 2D machining paths
Simulation
Subfile and post processor processing
Testing the produced NC programme with an NC machine

Learning Methods: Lectures and exercises

Assessment Exam (50%, assessment 1 - 5) and assignments and attendance (50%, assessment 1 - 5)

Methods:

Bibliography: Pikkarainen, E., Tietokoneavusteinen NC -ohjelmointi
Further material as indicated by the teacher

(TKAC010) Project Management, Part 1

Credits: 3 cr Timing: 1st yr

Learning Objectives: Students will learn how to work in a goal oriented way and the techniques that are usually applied to one-off assignments and tasks in the world of work.

Contents: Project concept
Project cycle
Planning and supervision methods
Steering and follow-up
Concluding the project

Learning Methods: Lectures and assignments

Assessment Methods: Exams and assignments

Bibliography: Silfverberg, P., Ideasta projektiksi
Pelin, R., Projektihallinnan käsikirja
Virkki, P., Somermeri, A:, Projektityö, kehittämisen moottori
Teaching handout

(TKAC011) Project Management, Part 2

Credits: 2 cr Timing: 2nd yr

Learning Objectives: Students will know how to use ADP applications effectively in project management.

Previous Learning: Project Activities Part 2

Contents: Project creation
Making use of dependencies
Adding resources
Monitoring project progress
Costs management
Reporting
Multi-project management

Learning Methods: Small group teaching Some teaching in English

Assessment Methods: Skills demonstration test, assignment

Bibliography: Chatfield, Johnson, MS Project Step by Step
Teaching handout

(TKAC003) Quality Management

Credits: 3 cr Timing: 1st yr

Learning Objectives: Students will gain in depth knowledge of quality and quality management as well as how these are linked to business operations. Students will know the most common business quality control operations and be able to analyse and use collected information from quality control systems to develop operations.

Contents:
Concepts of quality
Quality leadership
Quality control systems
ISO 9000 etc Quality standards
Quality control methods
Sampling methods
Statistical methods
Quality costs

Learning Methods: Lectures and course-work

Assessment Methods: Exam and assignments

Bibliography:
Andersson, Tikka, Mittaus- ja laatutekniikat, 1997
Pesonen, H., Saarinen, T., Asiantuntijayrityksen laatujärjestelmän kehittäminen
ISO 9000 laatustandardit
Kume, H., Laadun parantamisen tilastolliset menetelmät
Veräjänkorva, J., Laatutekniikka
Further reading/material provided by lecturer

(TKAC004) Introduction to Maintenance Technology

Credits: 3 cr Timing: 2nd yr

Learning Objectives: Students will understand the significance of maintenance in ensuring uninterrupted production in manufacturing and be conversant with the modern principles of maintenance and their application.

Contents:
Introduction to maintenance
Maintenance operations
Maintenance profit and efficiency
Maintenance data systems
Failures
Basics of Reliability

Learning Methods: Lectures and course-work

Assessment Methods: Exam and assignment

Bibliography:
Aalto, H., Kunnossapitotekniikan perusteet, Kunnossapitoyhdistys ry
Further reading/material provided by lecturer

(TKAC005) Operational Reliability

Credits: 3 cr Timing: 2nd yr

Learning Objectives: Students will be conversant with the theory of production engineering and maintenance and its applications. Students will be able to survey the reliability of a production line and manage the reliability features of products with aid of planning, sourcing and a service concept. Students will be able to use the most common

modelling and analysis methods and application programmes for reliability.

Previous Learning: Introduction to Maintenance Technology

Contents: The significance and concepts of reliability
Modelling and analysis procedures
Reliability calculations
Use of applications

Learning Methods: Lectures and exercises

Assessment Methods: exam and assignments

Bibliography: Reading list/material provided by lecturer

(TKAC006) Production Planning

Credits: 4 cr Timing: 3rd yr

Learning Objectives: Students will have wide knowledge of the operations of a manufacturing company and how the production processes are managed. The course also provides students with skills required in planning and implementing economically viable production process.

Contents: The basic concepts of production planning and control.
Layout and procedural planning
Loading
Material operations
Production control operational models

Learning Methods: Lectures and course-work

Assessment Methods: Exam and exercises

Bibliography: Lapinleimu, I. et al, Kone- ja metalliteollisuuden tuotantojärjestelmät
Harju, A. et al, Teollisuustalous, tuotantotalous
Karrus, K., Logistiikka

(TKAC007) Project/Laboratory Work, Manufacturing Technology

Credits: 3 cr Timing: 1st yr

Learning Objectives: Students will gain practical experience of production and the types of problems encoutered in the manufacturing process and be able to apply previously acquired theoretical knowledge to solve practical problems.

Contents: Practical tasks linked to Production Technology studies.

Learning Methods: Project work completed under supervision for businesses and educational institutions with required theoretical backup.

Assessment Methods: Completion of work set, appropriate documentation and reporting.

Bibliography: Students search for their topic information themselves using different information sources.

(TKAK2Z) MECHANICAL ENGINEERING 16 cr

This module introduces students to the basic functioning of machines, devices and structures as part of a larger unit.

(TKAK001) Construction Materials

Credits: 4 cr Timing: 1st yr

Learning Objectives: Students will gain an in depth overview of the economic significance of materials in product manufacturing, cost structure and use.

Contents:
The common features of metals
Materials testing methods
Metals
The general principles of polymers
Technical plastics
Technical ceramics
Composite materials

Learning Methods: Lectures and group work

Assessment Methods: Lectures and assignments

Bibliography: Koivisto, K., Laitinen, E., Niinimäki, M., Tiainen, T., Tiilikka, P., Tuomikoski, J., Konetekniikan materiaalioppi

(TKAK002) Mechanics and Mechanisms

Credits: 3 cr Timing: 1st yr

Learning Objectives: Students will be able to determine the stress levels of a statically determined solid and rigid part in simple structures and mechanisms.

Contents:
Particle statics
Rigid part plane-statics
Centre of gravity
Load levels of simple supports
Beam structures
Joint mechanisms

Learning Methods: Lectures and course-work

Assessment Methods: 2 interim exams

Bibliography: Outinen: Statiikka I and II
Further reading/material provided by lecturer

(TKAK003) Strength of Materials

Credits: 3 cr Timing: 2nd yr

Learning Objectives: Students will understand the link between structural loads and stress levels in a structure and be able to calculate strain in a completed structure in different basic cases and assess the importance of the result.

Contents: Introduction
Deformation
Types of strain
Different strain cases
Stability
Fatigue endurance limit

Learning Methods: Lectures and exercises

Assessment Methods: 2 interim exams

Bibliography: Hietikko, E PALKKI Lujuuslaskennan perusteet
Further material and reading provided by lecturer

(TKAK004) Mechanical Components

Credits: 3 cr Timing: 2nd yr

Learning Objectives: Students will be conversant with the usual components used in machine construction and be able to select the appropriate components according to the manufacturer's instructions and/or with the aid of ADP programmes.

Contents: Couplings
Bearings
Gears, breaks
Power transfer
Springs
Sealing

Learning Methods: Lectures and exercises

Assessment Methods: Final exam

Bibliography: As indicated by the teacher

(TKAK005) Project/Laboratory Work Tool Technology

Credits: 3 cr Timing: 3rd yr

Learning Objectives: Students will gain practical experience of work tool planning and design and the problems encountered in such a process thus having the opportunity to apply previously acquired theoretical knowledge to solve such problems.

Contents: A practical research and/or planning task linked to mechnical engineering studies.

Learning Methods: Supervised project work/laboratory tasks for businesses or educational institutions with the aid of theoretical backup.

Assessment Methods: Completion of set work, appropriate documentation and presentation. The course is completed as a part of RDI studies.

Bibliography: Students will search for project/laboratory topic linked material themselves using different sources of information.

(TKAJ3Z) ELECTRICAL ENGINEERING 9 cr

This module opens up the world of electrical engineering applications, electricity safety issues as well as state-of-the-art working methods and procedures.

(TKAJ001) Electronics

Credits: 3 cr Timing: 2nd yr

Learning Objectives: Students will be conversant with the principles of analog and digital electronics and how to carry out laboratory work.

Previous Learning: Physics Theory Of Electricity

Contents:
The principle equations of electronics
The principle components and connections of analog electronics
The principles of thermal planning
The principles of digital electronics
The principles of laboratory work

Learning Methods: Lectures, exercises and laboratory work

Assessment Methods: Exam and laboratory exercises

Bibliography:
Lecture handouts
Salo, P., Sähkötekniikan perusoppi, osat 4 ja 5
Salo, P., Analogista elektroniikkaa, Periaatteita ja sovellutuksia

(TKAJ002) Electrical Power Engineering

Credits: 3 cr Timing: 2nd yr

Learning Objectives: Students will understand how electrical energy is produced, transferred, the distribution system, the conditions of use demands and protection methods. Students will be able to select the appropriate motors, start-up and control methods for different uses of electricity. Students will be able to calculate price comparisons for different forms of energy and electricity prices and they will be proficient in power calculation.

Previous Learning: Physics / Theory of Electricity

Contents:
Electricity accidents and emergency aid
Conditions of use and protection methods
Production, transfer and distribution systems of electrical power
Pricing electricity and other forms of energy
The principles of electric motor engineering

Learning Methods: Lectures, exercises and laboratories

Assessment Methods: exams, assignments and laboratory work

Bibliography:
Suomen sähkö- ja teleurakoitsijaliitto ry sähköturvallisuuden edistämiskeskus ry, Käsikirja rakennusten sähköasennuksista(D1-2006)
Aura, L., Tonteri, A., Sähkölaitostekniikka Aura, L., Tonteri, A., Teoreettinen sähkötekniikka ja sähkökoneiden perusteet
Lecture handouts

(TKAJ003) Data Systems

Credits: 3 cr Timing: 1st yr

Learning Objectives: Students will be aware of the opportunities provided by up-to-date data transfer systems in making operations more efficient.

Contents: The structure and functions of a computer, hardware and software
Local area networks
Data transfer technology
Databases
EDI
Internet

Learning Methods: Lectures, course-work and laboratories

Assessment Methods: Exam and assignments

Bibliography: Reima, S., Organisaatioiden väliset tietojärjestelmät
Lapinleimu, I., Kauppinen, Torvinen, Kone- ja metalliteollisuuden tuotantojärjestelmät
Further reading/material provided by lecturer

(TKAP6Z) AUTOMATION TECHNOLOGY 25 cr

(TKAP001) Pneumatics

Credits: 3 cr Timing: 1st yr

Learning Objectives: Students will be conversant with the principles and components of pneumatics and how to apply this knowledge when working with machine autometion devices. The course also covers service issues.

Contents: The production and transfer of pressurised air
Pneumatics graphical symbols
Regulating elements
valves
Control of a compressed air system
Planning a compressed air system

Learning Methods: Lectures, course-work, laboratory work

Assessment Methods: exam, assignments

Bibliography: Ellman, A., Hautanen, J., Järvinen, K., Simpura, A., Pneumatiikka
Further reading/material provided by lecturer

(TKAP012) Workpiece Handling Equipment

Credits: 2 cr Timing: 1st yr

Learning Objectives: Students will be conversant with the devices used in automated manufacturing such as conveyors, storage and dosing devices.

Contents: Introduction

Different manufacturing systems
Conveyors and piece storage
Dosing and turning devices, grabs, and palettes

Learning Methods: Lectures and exercises

Assessment Methods: Exam (graded 1 - 5) (70%), attendance and assignments (30%)

Bibliography: Lecture handout
Further reading to be announced

(TKAP013) Robotics

Credits: 3 cr Timing: 2nd yr

Learning Objectives: Students will gain a general overview of how modern robots can be used in piece goods production and in the machine workshop and will be able to apply and programme robots.

Previous Learning: Piece Goods Processing Equipment

Contents: Robot statistics
Robot structures
Grippers and tools
Robot sensors
Use and programming of robots
Application examples and peripheral equipment
Connecting robots to other automation systems
Robot systems' safety and security

Learning Methods: Lectures, exercises, labs and industrial study visits

Assessment Methods: Exam (evaluation 1-5), attendance and completed industrial study visit

Bibliography: Lecture handouts
Further reading as indicated by the teacher

(TKAP003) Sensor Technology

Credits: 3 cr Timing: 1st yr

Learning Objectives: This course emphasises the significance of sensors and their usual structure and enables students to select the correct sensor for a particular use.

Contents: Principles of sensors
Connecting position tranducers
Telltale and twist sensors
Velocity measurement
Acceleration and vibration measurement
Power and pressure measurement
Temperature and flow measurement
Bar code and piece recognition
Automation safety procedures
Connecting sensors to the control system.

Learning Methods: Lectures, exercises, laboratory work, trade fair and study visits.

Assessment Methods: Exam (assessment 1 - 5) (70%), attendance and assignments (30%)

Bibliography: Lecture handout
Reading list/material provided by lecturer

(TKAP004) Control Systems

Credits: 3 cr Timing: 2nd yr

Learning Objectives: This course covers the implementation principles of different automation systems and the importance of control systems, as well as the structures of programmable devices and the principles of programming.

Contents: Principles of control
Coupling function
Programmable controllers
Programming controllers
The hierarchical structures of control systems
Frequency variables

Learning Methods: Lectures, exercises, laboratory work

Assessment Methods: Exam (assessment 1 - 5), assignments

Bibliography: Reading list/material provided by lecturer, handoutsAirila, Mekatroniikka, Otatieto, julakisu no. 897, ISBN 951-672-239-3
Ohjaustekniikan perusteet, Festo

(TKAP014) Flexible Manufacturing Systems

Credits: 3 cr Timing: 2nd yr

Learning Objectives: This course provides students with the ability to picture automated production possibilities in different production environments and to understand how production management works as a whole and at device level. Students will be able to combine previously acquired knowledge of different automation technology fields to form a cohesive whole and apply this knowledge when planning manufacturing systems.

Previous Learning: Pneumatics Robots and Piece Goods Handling Equipment Sensor Technology Control Systems

Contents: The principles of automated production
The levels of flexible manufacturing
Information management in MFS
Work safety and automated systems
Finance for automated systems

Learning Methods: Lectures and exercises

Assessment Methods: Exam and assignments

Bibliography: Reading list/material provided by lecturer

(TKAP019) LabView

Credits: 2 cr Timing: 2nd yr

Learning Objectives: Students will know the principles of the LabView programming language.

Contents: User interface, diagram window and tool palette
Structures and loops
Types of data
Tables
Character strings and clusters
Variables
Document processing

Learning Methods: Lectures and exercises

Assessment Methods: Assignment

Bibliography: Handout

(TKAP007) Project/Laboratory Work, Automation Technology

Credits: 3 cr Timing: 2nd - 3rd yr

Learning Objectives: Students will gain practical experience of different areas of automation and systems and will learn how to apply acquired theoretical knowledge in practice.

Contents: Automation technology labs

Learning Methods: Project/labs completed under the supervision of the teacher for companies or the university combined with related theoretical back-up.

Assessment Methods: Completion of all tasks set and documentation

Bibliography: Students procure the material required for the project/lab using different sources of information.

(TKAP016) Project/Laboratory Work, Flexible Manufacturing Systems

Credits: 3 cr Timing: 2nd - 3rd yr

Learning Objectives: Students will gain experience of the practical tasks associated with flexible manufacturing systems and will learn to apply acquired theoretical knowledge during these tasks.

Contents: Practical research and planning assignments related to flexible manufacturing systems studies.

Learning Methods: Projects/labs carried out in companies and educational establishments and related theoretical back-up information.

Assessment Methods: Accomplishment of all set tasks and documentation.

Bibliography: Students will procure all the material required for the project/lab topic themselves

using different sources of information.

OPTIONAL PROFESSIONAL STUDIES

Students may select one of the following modules as their professional studies: Electronics Manufacturing or Computer-aided Production. Within optional studies groups will be formed of a minumum of 10 and maximum of 15 students. If the groups cannot be formed according to which module students have selected, access to each module will be based on the number of and performance in courses passed. For Electronics Manufacturing these courses are: Manufacturing Technology, Quality Management, Electronics, Control Systems. Computer-aided Production: Manufacturing Technology, English Studies, 3-D Modelling, Introduction to Maintenance Technology, Piece Goods Process Equipment and Robots

(TKVK0Z) MECHANICAL PLANNING 15 cr

(TKVK001) The Principles of Mechanical Planning

Credits: 3 cr Timing: 3rd yr

Learning Objectives: Students will understand the significance of a systematic product planning method and financial issues in product planning.

Contents: Systematic mechanical planning
Product planning for flexible and economically viable production
Planning a modular product concept
Reliability and safety

Learning Methods: Lectures and exercises

Assessment Methods: Exam

Bibliography: Airila M, co Koneenosien suunnittelu

(TKVK002) Vibration Mechanics

Credits: 3 cr Timing: 3rd yr

Learning Objectives: Students will understand vibrations while being able to analyse the size of a vibration, use vibration management planning methods and measure vibrations.

Contents: The parts of a vibrating system
The natural vibration for one degree of freedom
The harmonic forced vibration of one degree of freedom
The general forced movement for one degree of freedom
The equations of motion for a system of several degrees of freedom
The natural vibration for a system of several degrees of freedom
The forced vibration of several degrees of freedom
Studies of practical vibration by iLearnVibration software.

Learning Methods: Lectures and assignments

Bibliography: To be announced when lectures begin

(TKVK003) Finite Element Method (FEM)

Credits: 3 cr Timing: 3rd yr

Learning Objectives: Students will know the principles of the FEM and FEM calculations using application programmes.

Previous Learning: Strength of Materials

Contents: Principles of the Finite Element Method.
The stages of FEM calculation.
Exercises

Learning Methods: Lectures and exercises

Assessment Methods: Exercises

Bibliography: Reading List provided by the lecturer

(TKVK004) Product Development

Credits: 3 cr Timing: 3rd yr

Learning Objectives: Students will gain knowledge of product development in industrial operations and the different stages of product development.

Contents: Recognising customer needs
Applying creative working techniques during product development
Specifying the product, outlining, documentation and finalising

Learning Methods: lectures, exercises, project assignment

Assessment Methods: Exam and project assignment

Bibliography: Välimaa, et al, Tuotekehitys. Asiakastarpeesta tuotteeksi.

(TKVK005) Mechnical Planning Project Work

Credits: 3 cr Timing: 3rd yr

Learning Objectives: Students will carry out practical mechanical planning tasks and learn to apply acquired theoretical knowledge.

Previous Learning: Product Development

Contents: practical research, development and planning assignments

Learning Methods: Project cooperation with companies

Assessment Methods: Completion of project assignment and reporting

Bibliography: Source material related to the topic covered by the project assignment

(TKVN0Z) NC PRODUCTION 15 cr

(TKVN006) NC Piece Work Planning

Credits: 3 cr Timing: 3rd yr

Learning Objectives: Students will be able to work as supervisors or forepersons in a machine workshop, gaining the ability to plan NC piece tooling.

Previous Learning: Introduction to NC Technology

Contents: Designing NC pieces
Securing NC pieces
NC piece phasing
New NC machines
Group technology

Learning Methods: Lectures, exercises

Assessment Methods: Exam, (evaluation 1 - 5) 50 % and assignments (evaluation 1 - 5) 50 %

Bibliography: Pikkarainen, E., Mustonen, M., Numeerisesti ohjatut työstökoneet

(TKVN002) Computer-Aided NC Programmming

Credits: 3 cr Timing: 3rd yr

Learning Objectives: Students will know how to use CAD 3D applications and how to programme machining paths based on a created geometry for producing NC programmes for numerically controlled machining tools.

Previous Learning: Introduction to Data Processing CAD 3D Modelling Introduction to NC Technology

Contents: The stages of CAD NC programming
Processing transferred CAD geometry
Creating 3D machining paths
Creating machining paths for turning
Simulating and finishing machining paths
Testing produced NC programmes and NC machining

Learning Methods: lectures and exercises

Assessment Methods: Exam (50 %, evaluation 1 - 5), assignments and attendance (40%) and study visits (10 %)

Bibliography: Pikkarainen, E., Tietokoneavusteinen NC -ohjelmointi
Further reading will be provided by the lecturer

(TKVN003) The Integrated Production System

Credits: 3 cr Timing: 3rd yr

Learning Objectives: Students will know the concepts of integrated production and how to apply and plan the different areas of integrated production systems.

Previous Learning: Introduction to NC Technology 3D Modelling

Contents: CAM and CIM
CIM in practice
Programming and using robots

Learning Methods: Lectures, study visits and team work

Assessment Methods: Exam (evaluation 1-5)(50 %) and assignment participation (evaluation 1-5)

Bibliography: Pikkarainen, E., Integroitu tuotantolaitos
Further reading will be provided by the lecturer

(TKVN004) Sheet Metal Piece Production

Credits: 3 cr Timing: 3rd yr

Learning Objectives: Students will know the properties and production opportunities of sheet metal pieces. They will also be able to apply modern sheet metal production methods.

Previous Learning: Introduction to NC Technology and 3D Modelling

Contents: Thin sheet pieces and their planning
Traditional methods of sheet metal production
Modern methods of thin sheet metal production
Layout programmes
The sheet metal work centre and its structure
Laser and water cutting

Learning Methods: Lectures, study visits and exercises

Assessment Methods: Exam (evaluation 1-5) 50 %, exercises and study visits 50 %

Bibliography: Reading list provided by the lecturer
Handout

(TKVN005) NC Production Project Work

Credits: 3 cr Timing: 3rd or 4th yr

Learning Objectives: Students will gain practical experience of NC machining tools, problems that may arise and they will also learn to apply their acquired theoretical knowledge to practical problems.

Previous Learning: 3D Modelling Introduction to NC technology CAD NC Programming and The Integrated Production System

Contents: Practical research and/or production assignments related to NC production studies.

Learning Methods: Project assignments carried out under the teacher's supervision for companies or the university with the required theoretical back-up.

Assessment Methods: Completion of the assignment and its documentation and presentation

Bibliography: The students must procure the material covering the topic of their project assignment using different sources of information.

(TKVV0Z) VIRTUAL PRODUCTION 15 cr

(TKVV001) Virtual Modelling of Production

Credits: 6 cr Timing: 3rd yr

Learning Objectives: Students will be proficient in the opportunities provided by computer-aided modelling for production system planning and they will learn the basic techniques of modelling in practice.

Contents:
The concepts and principles of modelling
The parts and equipment of virtual production
Use of workers in the model
Piece handling and conveyor devices
The kinematics of the computer model
Analysing performence of the model

Learning Methods: Lectures and group work

Assessment Methods: Practical skills test

Bibliography: Tutorials with visiting experts

(TKVV002) Robots in Manufacturing

Credits: 3 cr Timing: 3rd yr

Learning Objectives: Students will be able to make and use a virtual model to programme and simulate robot applications.

Previous Learning: Piece Handling Devices, Robotics, Introduction to computer aided programming, 3D modelling.

Contents:
Constructing a virtual model of a robot station
Connecting the virtual model to the production system
ABB IRB 140 robot and IRC5 control
Programming of robot movements and signals in the virtual model
Simulating and carrying out piece handling operations with robots
Simulating and carrying out milling machining paths with robots

Learning Methods: Lectures and assignments

Assessment Methods: Assignments

Bibliography: Material will be provided by the lecturer

(TKVV005) 3D Modelling Continuation Course

Credits: 3 cr Timing: 3rd yr

Learning Objectives: Students will gain wide-ranging knowledge of 3 D CAD software for use in design.

Previous Learning: 3D Modelling

Contents: User interface

Partial modelling
Creating drawings from a 3 D model
Assembly drawings, limitations, adaptability and collision checks
Assembly animations
Parameters and integration, product family
Sheet metal design

Learning Methods: Lectures and exercises

Assessment Methods: Skills demonstration test and assignments

Bibliography: Handout

(TKVV004) Virtual Production Project Work

Credits: 3 cr Timing: 3rd yr

Learning Objectives: Students will model a production environment as realistically as possible. This course trains students to outline different types of production situations to to discover where there should be developments made to make production more efficient using the computer model.

Contents: Finding a suitable project
Modelling the system
Analysis
Compilation of development plan

Learning Methods: Project work completed under supervision for companies or educational establishments including relevant theoretical back-up knowledge.

Assessment Methods: Independent work completed as agreed including documentation and presentation.

Bibliography: Students must acquire their own material for the project using different sources of information.

(TKVP0Z) MAINTENANCE 15 cr

(TKVP001) Maintenance of Production Systems

Credits: 3 cr Timing: 3rd yr

Learning Objectives: This course provides in depth knowledge of maintenance concepts and specific engineering skills to ensure the functioning of equipment and structures and their economic and long-term use.

Previous Learning: Introduction to Maintenance

Contents: Maitenance operations in a manufacturing plant
Corrosion prevention, general corrosion
Surface treatments
Lubrication
Rotating devices
Vibration measurements
Corrosion and electronics
ESD

Reliability-oriented maintenance (RCM)

Learning Methods: Lectures and assignments

Assessment Methods: Exam and assignment

Bibliography: To be announced

(TKVP002) Energy Technology

Credits: 3 cr Timing: 3rd yr

Learning Objectives: Students will know the basics of thermal engineering, energy sources, production and use and saving energy.

Previous Learning: Introduction to Maintenance

Contents: Heat transfer
Energy supply
The production of energy
The sensible use of energy

Learning Methods: Lectures and exercises

Assessment Methods: Exams and assignments

Bibliography: Material will be indicated by the lecturer

(TKVP003) Industrial Pipelines

Credits: 3 cr Timing: 3rd yr

Learning Objectives: Students will know the basics of pipeline planning and be able to select and survey the components required in the pipeline and understand the official systems concerning pipelines.

Previous Learning: Introduction to Maintenance

Contents: Pipeline plans and drawings
The basics of flow technology
Pumps and pipeline equipment
Preparation and installation of pipelines
Inspections and official regulations

Learning Methods: Lectures and exercises

Assessment Methods: Exams and assignments

Bibliography: Kesti, M. Teollisuusputkistot
Further material will be indicated by the lecturer

(TKVP004) Technical Diagnostics

Credits: 3 cr Timing: 3rd yr

Learning Objectives: Students will be proficient in fault and condition monitoring diagnostics.

Previous Learning: Introduction to Maintenance

Contents: Technical methods in condition monitoring
How faults come about
Practical measurements and laboratory work

Learning Methods: lectures, exercises and laboratory work

Assessment Methods: Exam and assignments

Bibliography: Material will be indicated by the lecturer

(TKVP005) Maintenance Project Work

Credits: 3 cr Timing: 3rd yr

Learning Objectives: Students will gain experience in practical maintenance tasks and learn to apply acquired theoretical knowledge.

Previous Learning: Introduction to Maintenance

Contents: Practical research, development and planning assignments

Learning Methods: Project assignments in collaboration with businesses or other partners in cooperation

Assessment Methods: Completion,report of the project assignment and possible seminar. The course will be completed as RDI studies.

Bibliography: Source material related to the project assignment topic

(TKVJ0Z) PRODUCTION LEADERSHIP 15 cr

(TKVJ001) Company Operations and Leadership

Credits: 3 cr Timing: 3rd yr

Learning Objectives: Students will understand the strategy and production process stages related to company operations and products.

Contents: A company's operational environment and changes in the environments
Product life-cycle and cost structure
from idea to product (techniques and analyses)
Forms of production and data systems
Testing and quality
Patenting and funding
Suppliers and subcontracting

Learning Methods: Lectures and exercises

Assessment Methods: Exam and assignment

Bibliography: Karjalainen, E., Quality Function Deployment
Material as advised by teacher

(TKVJ002) Operation Supervision Methods

Credits: 3 cr Timing: 3rd yr

Learning Objectives: Students will know different operation supervision methods and their features and will learn to use the different principles of operation supervision in different practical situations and surroundings. Students will be able to perceive the opportunities of different methods and procedures from a management and economic point of view.

Contents: Basic methods
Operation supervision and organisation
Business networks and outsourcing
Sourcing operation supervision systems
Operation supervision in practice

Learning Methods: Lectures and exercises

Assessment Methods: Exam, assignment

Bibliography: Karjalainen, J. et al, Kehittyvä toiminanohjaus
Möller, K. et al, Tulevaisuutena liiketoimintaverkot
Karjalainen, J. et al, Tuotannollinen ulkoistaminen
Vilpola, I. et al, Toiminnanohjausjärjestelmän hankinta C-CEI-menetelmän avulla

(TKVJ003) Manufacturing Process's and Logistics

Credits: 3 cr Timing: 3rd year

Learning Objectives: Students will learn to understand production operations as processes while adopting a process-oriented way of thinking and the principles of process leadership. Students will become proficient in process modelling for practical situations and they will gain an overview of the logistics chain and how to manage it using different control and rationalization methods.

Contents: Process leadership
Process modelling
Logistics of industrial production
Controlling logistics
Logistics efficiency and technologies
Organisation of logistics operations

Learning Methods: Lectures and exercises

Assessment Methods: Exam, assignments

Bibliography: Karrus, K., Logistiikka
Material as advised by the lecturer

(TKVJ004) Commodification and Production

Credits: 3 cr Timing: 3rd yr

Learning Objectives: Students will understand the significance of commodification and production in successful business ventures by doing exercises and using examples.

Contents: Customer needs recognition.
Product development
Product life-cycle
Organising production and bringing the product to the customer.
Manufacturing and installation-oriented design

Learning Methods: Lectures and assignments

Assessment Methods: Exam and exercises

Bibliography: Reading list provided by lecturer

(TKVJ005) Production Leadership Project Work

Credits: 3 cr Timing: 3rd year

Learning Objectives: Students will gain practical experience of production leadership and management, problems that can arise and how to apply theory in practice.

Contents: Practical research and/or planning assignments linked to production leadership studies.

Learning Methods: Supervised project work for companies or educational establishments and relevant theoretical back-up.

Assessment Methods: Accomplishment and documentation of all agreed tasks and presentation.

Bibliography: Students must acquire the required material for their project work from different sources.

(TKVA0Z) MINING TECHNOLOGY 15 cr

(TKVA001) Mining Industry

Credits: 3 cr Timing: 3rd yr

Learning Objectives: To provide information on the legislation and permit procedures of the extractive industry. Students will gain knowledge of stoping methods as well as stoping and ore transportation devices. The course also provides basic knowledge of the special features of environmental issues linked to the extractive industry and how they are dealt with, as well as legislation and permit procedures.

Contents: The extractive industry in Finland.
Claiming and environmental effects evaluation procedure
Stoping and ore handling
The special features of underground mining operations
Environmental technology
Environmental protection and legislation

Learning Methods: Lectures, assignments

Assessment Methods: Exam, assignments

Bibliography: Material as indicated by the lecturer

(TKVA002) Introduction to Geology

Credits: 3 cr Timing: 3rd yr

Learning Objectives: Students will get to know the basic concepts of geology and the most important minerals as well as an overview of mineralogical raw materials.

Contents:
Basic geological processes
The geology of Finland
Stone types and minerals
Searching for ore
The use of ore deposits
Pre-mining surveys

Learning Methods: Lectures, assignments

Assessment Methods: Exam, assignments

Bibliography:
Lecture handout
Other material as indicated by the lecturer

(TKVA006) Particle and Benefication Technology

Credits: 6 cr Timing: 3rd yr

Learning Objectives: Students will be conversant with basic mineral processing, the properties of granulose material, the unit processes and equipment of particle engineering. Students will know basic beneficiation methods and the structures of beneficiation equipment. Students will gain knowledge of pumping, pumps and the transfer of suspended solids and fluids and the separation of solids from water/gas mixtures.

Previous Learning: Introduction to Geology

Contents:
Crushing, grinding and classification
Implementing crushing and grinding circuits
Fine grinding technology devices
Flotation
Specific gravity and magnetic separation
Fluid mechanics and fluids transfer
Solids separation
Pumping and screening
Equipment maintenance

Learning Methods: Lectures, assignments and laboratories

Assessment Methods: Exam, assignments and laboratories

Bibliography: To be announced

(TKVA005) Hydrometallurgical

Credits: 3 cr Timing: 3rd yr

Learning Objectives: Students will be proficient in the basics of hydrometallurgical chemistry and core processes such as leaching, the purification and filtration of the leaching (pregnant)solution and the reduction of metal from a water-based pregnant solution.

Previous Learning: Introduction to Chemistry Particle Technology Benefication Technology

Contents: Introduction to hydrometallurgy
The chemical principles of hydrometallurgy
Leaching and pregnant solution purification
The reduction of metal from a water-based pregnant solution
The core processes of hydrometallurgy
The peripheral processes of hydrometallurgy

Learning Methods: Lectures, calculation exercises

Assessment Methods: Exam

Bibliography: Lecture handout
Other material as indicated by the teacher

(VAPAAZ) FREE-CHOICE STUDIES 15 cr

Students can freely select 15 cr of studies that will support their professional development, from their own field/degree programme or from another degree programme in their own university of applied sciences, from another university of applied sciences or science university. Students will achieve wide-ranging expertise.

(TRW015) Build up Your English

Credits: 3 cr Timing: 1st yr

Learning Objectives: Students will develop and strengthen their language skills acquired during previous courses in order to be able to cope with their compulsory professional language studies. The aim is also to develop language learning skills.

Previous Learning: Proficiency test

Contents: Basic grammar and vocabulary
Activation of speaking and writing skills as well as reading and listening comprehension.

Learning Methods: Contact teaching

Assessment Methods: Active participation, exercises

Bibliography: Text book and/or handout

(TRW016) Bygg Upp Din Svenska

Credits: 3 cr Timing: To be announced

Learning Objectives: This course develops and strengthens Swedish skills acquired during earlier courses so that students will be able to cope with UAS level compulsory Swedish language studies in their own field of studies. The aim is also to develop language study skills.

Previous Learning: Proficiency test

Contents: Basic grammar and vocabulary.
Activating speaking and writing skills as well as listening and reading comprehension.

Learning Methods: Supervised exercises

Assessment Methods: Active participation 100 %, exam

Bibliography: Handout

(TYW093) Maintenance Vibration Measurement

Credits: 3 cr Timing: 4th yr

Learning Objectives: Students will deepen their maintenance vibration measuring competence in the condition monitoring of rotating machines and devices by carrying out vibration measurements and analysis exercises.

Previous Learning: Technical Diagnostics

Contents: Bearing faults
Imbalance
Alignment faults
Special features of gears, electric motors, blowers and pumps
Vibration measurement of slowly rotating devices

Learning Methods: Practical measurements and analysis exercises. Studies completed as part of RDI studies

Assessment Methods: Practical measurements

Bibliography: To be announced

(TYW094) Robot Programming

Credits: 3 cr Timing: 3rd yr

Learning Objectives: Students will have in depth competence in programming different types of industrial robots for a variety of industrial applications.

Previous Learning: Piece Handling Devices. Sensor technology, Robotics, Control Systems

Contents: Programme structure
Forms of movement and movement commands
Programme variables and constants
Condition and repetition structures
I/O functions

Learning Methods: Lectures, exercises and laboratories

Assessment Methods: Exam, assignments

Bibliography: Lecture handouts, other material as indicated by the teacher

(TYW095) Rock Blasting Technique

Credits: 3 cr Timing: 3rd - 4th yr

Learning Objectives: Students will know modern mining techniques and be able to choose the right equipment for different extraction targets. They will know mining safety regulations and be proficient in the basics of rock blasting planning.

Contents: Drilling and charging technology
Open-pit and underground mining methods
Basics of mining planning
Blasting work and the environment
Blasting regulations
Blasted rock handling and quarrying equipment

Learning Methods: Lectures and assignments

Assessment Methods: Exam and assignments Studies will partly be completed as a part of RDI studies

Bibliography: Vuolio & Halonen (2010) Räjäytystyöt. Hakapää & Lappalainen (2009) Kaivos- ja louhintatekniikka. Lecture handouts

(TYW096) Mine and Surface Mining Automation

Credits: 3 cr Timing: 3rd - 4th yr

Learning Objectives: Students will be conversant with the 3D planning and modelling of mines and will be familiar with automation used in open-pit and underground mining.

Contents: 3D planning and modelling of mines
GPS and GNSS positioning technology
Underground positioning and control methods
Measure While Drilling techniques
Work machine 3D systems
Open-pit and underground mining automation systems

Learning Methods: Lectures and assignments

Assessment Methods: Exam and assignments Partly carried out as RDI studies

Bibliography: Literature and material as indicated by teacher

(TYW097) Particle and Benefication Technology 2

Credits: 3 cr Timing: 4th yr

Learning Objectives: Students will deepen their competence in the different sub-processes of ore

benefication They will be familiar with the planning,dimensioning and special features of the benefication plant's different processes

Previous Learning: Particle and Benefication technology

Contents: Crushing and grinding circuits and their dimensions
Flotation circuit planning and dimensioning
Special methods for dealing with different types of ore

Learning Methods: Lectures and exercises

Assessment Methods: Exam and exercises

Bibliography: To be announced

(TYW098) Occupational Legislation and Safety

Credits: 3 cr Timing: Free, recommended 3rd or 4th yr

Learning Objectives: Students will have an overview of work place operational models and of a safe working environment. They will know the occupational safety organisation as well as work safety issues from the point of view of occupational safety legislation and healthcare legislation. Students will be able to perceive the duties, responsibilities and incentives of the employer and employee in terms of employment contracts, work time legislation, occupational safety and healthcare legislation. Students will understand the economic and productive significance of occupational safety.

Previous Learning: None

Contents: Work place rules
Occupational safety legislation and rules
Healthcare legislation and certain government decisions
Work time legislation, contracts of employment
Work place work safety notices
Work requiring official permits
Physical and mental occupational safety
Occupational healthcare arrangements
Duties and responsibilities managers
Orientation
Job satisfaction

Assessment Methods: Lectures, exercises and independent learning assignment

Bibliography: Study handout and study material provided during the lessons

(TYW099) The Grinding and Classification Technology of the Ultra Fine Area

Credits: 3 cr Timing: 4th yr

Learning Objectives: Students will know the demands and special features of grinding and classification technology in the ultra-fine area as well as the grinding and classification of fine matter, the structures and equipment of grinding and classification circuits and adjustment principles.

Previous Learning: Particle and Benefication Technology

Contents:
- Ultra fine material uses now and in the future
- energy consumption as a function of the ultra fine area
Ultra fine area dry grinding methods and equipment
- Dry classification methods and equipment
Wet grinding methods and equipment
Adjustment principles and methods

Learning Methods: Lectures, exercises and laboratories

Assessment Methods: Exam, exercises and laboratory work

Bibliography: To be announced

(TYW078) Quality Technology Continuation Course

Credits: 3 cr Timing: 3rd - 4th yr

Learning Objectives: Students will know quality systems, quality leadership and control systems. Students will be proficient in the effective use of a quality control programme.

Previous Learning: Quality Engineering

Contents:
Quality systems
Quality leadership tools
Company development programmes
Quality standards ISO 9000, 9001 and 9004
Quality control programme Minitab
Gage R&R
QFD
Taguchi
Fault and consequence analysis

Learning Methods: Lectures and assignments

Assessment Methods: Assignments

Bibliography: To be announced

(TKOO0Z) THESIS 15 cr

(TKOO001) Thesis

Credits: 15 cr Timing: 4th yr

Learning Objectives: The thesis enables students to apply acquired theoretical knowledge and skills to expert tasks linked to their own chosen field of studies. The thesis subject is usually agreed upon and commissioned by a client in real working life which supports students' professional growth in their own field. The thesis provides a wide ranging view of the author's abilities.

Contents:
Finding and agreeing on a suitable topic
Completion of necessary documentation

Acceptance process
Completion of thesis
Presentation of thesis
Maturity test

Assessment Methods: The thesis must be completed and reported according to given instructions. The thesis can be completed as a part of RDI studies.

(TKHH0Z) PRACTICAL TRAINING 30 cr

(TKHH001) Practical Training

Credits: 30 cr Timing: 4th yr

Learning Objectives: The aim of the practical training period is to provide students with good post graduation employment opportunities and to familiarise students with working life. Students will gain knowledge of different job tasks, working procedures, devices and professional terminology related to their chosen specialism in a real working environment under supervision. The practical training period takes place during the autumn semester of the fourth study year. The practical training co-ordinator is responsible for informing students of practical training issues together with the head of the degree programme.

Previous Learning: Students must have 135 cr before starting their practical training period.

Contents: A continuous approx five month training period in working life

Assessment Methods: Practical training accrues credits for RDI studies.

CONSTRUCTION ENGINEERING DEGREE PROGRAMME

This degree programme covers building production, renovation building and long-term facility management planning. Common professional studies provide wide-ranging basic knowledge of different areas of construction engineering. Optional studies provide specialist knowledge of production technology, facility management or timber construction.

Construction Engineering Degree Programme	Description of competence
Environmental responsibility and life-cycle competence in construction	• Life-cycle technology management • Knowledge and control of the environmental effects of construction products and production • Lifetime measurement management • Facility maintenance and finance management
Structural design competence	• Structural planning competence involving different materials for house and environmental structures • Static structure operation management • Management of physical and chemical phenomena in construction and the ability to take them into account during planning • Understanding of the effects of other fields (architectural design and geotechnical planning, housing engineering) of planning
Construction process competence	• Outsourcing construction of houses and environmental structures, contracting and leadership • Customer-orientation • Production control management • Taking into account the effects of heating, plumbing, air conditioning, electrics and automation technologies • Construction quality and safety management
Economic competence for the construction industry	• Building project cost management • Investment calculation and running cost management • Understanding how costs are incurred • Knowledge of construction entrepreneurship within business economics
Management and leadership competence	• Management system control • Quality management • Occupational safety and well-being management • Organizational leadership • Work contract competence • Competence in interpersonal relationships
Specialist competence in renovation	• Renovation building process and technology management

	• Understanding of the functional, historic and aesthetic value of buildings during different eras • Comprehension of the opportunities provided by the protection of buildings • Knowledge of building materials, structures and methods from different eras • Understanding of factors affecting the evaluation of a building's functional capacity and condition and of methods of renovating different building parts and structures
Facility management competence	• Comprehension of facility maintenance as a systematic process covering the whole life-cycle of a facility or property

THEMES FOR EACH YEAR OF STUDY

1st yr

Engineering orientation
Students will gain an overview of the most significant areas in building production and facilities maintenance and will be able to acquire the knowledge and skills to manage such areas.

2nd yr

Deeper knowledge
This theme covers learning how to apply technological economic thinking to real targets and communication and group work skills.

3rd yr

Specialisation
Students will gain specialised knowledge of a particular area and learn to apply theory in practice.

4th yr

Finalisation of competence
This theme covers the deepening and application of independent, responsible and wide-ranging thinking to a practical problem and familiarisation with management level and expert operations.

DEGREE PROGRAMME IN CONSTRUCTION ENGINEERING

BASIC STUDIES	**50 cr**
LANGUAGE AND COMMUNICATION SKILLS	**12 cr**
Finnish Language and Communication	3 cr
Text and Terminology	3 cr
Svenska för Byggingenjörer	3 cr
Introduction to Data Processing	3 cr
BUSINESS STUDIES	**8 cr**
Introduction to Business Economics	3 cr
Leadership and Interpersonal Skills	5 cr
STUDIES IN MATHEMATICS AND NATURAL SCIENCES	**30 cr**
Mathematics 15 cr	15 cr
Physics 12 cr	12 cr
Chemistry 3 cr	3 cr
COMPULSORY PROFESSIONAL STUDIES AND PROJECT WORK	**112 CR**
English Language and Communication Studies	3 cr
Device Technology	8 cr
Business Economics and Law	6 cr
Building Design and Construction	16 cr
Construction Economics	13 cr
Production Technology	12 cr
Construction Technology	19 cr
Renovation Building	24cr
Facility Maintenance	11 cr
ALTERNATIVE PROFESSIONAL STUDIES	**18 cr**
Facility Management	12 cr
Production Technology	12 cr
Timber Construction	12 cr
Optional Project Work	6 cr
FREE-CHOICE STUDIES	**15 cr**
PRACTICAL TRAINING	**30 cr**
THESIS	**15 cr**

COURSE DESCRIPTIONS FOR THE DEGREE PROGRAMME IN INFORMATION TECHNOLOGY

BASIC STUDIES

(TTPV2Z) LANGUAGE AND COMMUNICATION SKILLS 15 cr

(TTPV008) Communication Skills in Finnish 1

Credits: 3 cr Timing: 1st yr

Learning Objectives: Students will practise oral and written communication required in working life and their chosen profession.

Contents: An introduction to oral and written communication
Academic writing
Situations requiring oral communication (preparation, participation, analysis)
Introduction to team work, negotiation situations and meetings

Learning Methods: Independent work, group work, supplementary lectures

Assessment Methods: Participation in group work, assignments, exam and portfolio

Bibliography: Kauppinen, A., Nummi, J., Savola, T., Tekniikan viestintä (10., uudistettu painos)

(TTPV009) Communication Skills in Finnish 2

Credits: 2 cr Timing: 4th yr

Learning Objectives: Students will learn technical writing skills.

Contents: Documentation of the engineering thesis
Technical writing
Language issues

Learning Methods: Independent work, group work, supplementary lectures

Assessment Methods: Participation in group work, assignments and exam

Bibliography: Kauppinen, A., Nummi, J., Savola, T., Tekniikan viestintä (10., uudistettu painos)
Nykänen, O., Toimivaa tekstiä. Opas tekniikasta kirjoittaville.

(TTPV014) Basics of ICT English

Credits: 1.5 cr Timing: 1st yr

Learning Objectives: ICT students will be able to read professional texts related to their field of studies and write technical documents.

Prerequisite: Proficiency test and Build up Your English course if required

Contents: Technical English as a tool
The special grammatical features of technical English
Building of vocabulary for own engineering field
Development of reading techniques
Documentation practice

Learning Methods: Contact teaching, independent work, pair and group work

Assessment Methods: Active participation, exercises, written exam

Bibliography: Course handout

(TTPV015) Advanced ICT English

Credits: 2.5 cr Timing: 2nd yr

Learning Objectives: ICT students will be able to read professional technical literature, write technical documents and search for and process information concerning their field of studies.

Contents: Special grammatical features of technical language
Building of vocabulary for own engineering field
Development of reading techniques
Documentation practice
Spoken and written reporting and summarizing

Learning Methods: Contact teaching, independent work, pair and group work

Assessment Methods: Active participation, searching for technical texts, processing and oral presentations

Bibliography: Students' processed texts 5-0

(TTPV013) Svenska för fordonsingenjörer

Credits: 3 cr Timing: 3rd yr

Learning Objectives: Students will develop their oral and writing skills in Finland's second official language for use in their chosen professional field.

Contents: Vehicle technology central vocabulary and language use situations

Learning Methods: Supervised exercises

Assessment Methods: Active participation (100 %), oral and written exercises, written exam

Bibliography: Ledtråd till teknisk svenska: Maskin- Bil- El- Elektronik- IT

(TTPV007) Data Processing, Basics

Credits: 3 cr Timing: 1st yr

Learning Objectives: Students will be conversant with basic IT and data security. They will know how to use the UAS computers, their most usual tools programmes and peripheral devices used during studies.

Contents: Introduction to IT
Kajaani UAS information system
Directory structure
Information security
Word processing
Presentation graphics
Spreadsheet accounting
Health and the work environment

Learning Methods: Contact and online teaching

Assessment Methods: Exam and online assignments

Bibliography: Reading list/material provided by lecturer

(TTPK0Z) PRODUCT DEVELOPMENT 13 cr

(TTPK001) Introduction to Vehicle Information Systems

Credits: 1 cr Timing: 1st yr

Learning Objectives: Students will gain an overview of how vehicles work and of vehicle information systems on a practical level.

Contents: Overview of vehicle engineering
Route technology device solutions
Introduction to companies in the area
Practical exercises - how does a vehicle work?

Learning Methods: Contact teaching and independent work

Assessment Methods: Participation in group work and assigments

Bibliography: Lecture handouts
Online material

(TTPK002) The Basics of Project Finance

Credits: 3 cr Timing: 1st yr

Learning Objectives: Students will understand the concept of project finance and the importance of cost control in project work. Students will be proficient in product development procedure and be able to apply this knowledge in their own product development project.

Prerequisite: Introduction to Product Development Project

Contents: Project cost control
Effective time management
Sourcing management
Product development procedure
Customer oriented product development
Determining customer needs and standards
Commodification of the project

Learning Methods: Lectures and exercises

Assessment Methods: Exam and compilation of standards and project plan update

Bibliography: Pelin, R., Projektihallinnan käsikirja
A Guide to the Project Management Body of Knowledge
Lecture handouts

(TTPK003) The Basics of Product Development Project

Credits: 3 cr Timing: 1st yr

Learning Objectives: Students will be proficient in the concepts of project work, and its operational model as well as being able to compile a project plan. Students will be conversant with the embedded system product development process.

Prerequisite: Introduction to Vehicle Information Systems

Contents: From idea to project
Organisation and start-up
Project planning
Project time and resource management
Ending a project
Embedded system product development process

Learning Methods: Lectures, assignments

Assessment Methods: Exam, exercises and compilation of project plan

Bibliography: Pelin, R., Projektihallinnan käsikirja
A Guide to the Project Management Body of Knowledge
Lecture handouts

(TTPK004) Product Development Legislation

Credits: 3 cr Timing: 4rd yr

Learning Objectives: Students will be aware of the general tenets and effects of contract and intellectual property rights and legislation in product development.

Contents: General contract legislation
Employment contract, working time and annual holidays
Commercial technology and cooperation agreements/contracts
Intellectual property rights (IPR) in business

Learning Methods: Online and blended

Assessment Methods: Exercises and exam

Bibliography: To be announced

(TTPK005) Project Leadership

Credits: 3 cr Timing: 4th yr

Learning Objectives: Students will deepen their knowledge of project-based work, being proficient in project leadership with the ability to develop project-based activities.

Prerequisite: Introduction to project Finance

Contents: A project as a form of leadership
Interaction and working as a team in a project
Project quality control
Project risk management
Developing company project management
Professional ethics

Learning Methods: Lectures, exercises

Assessment Methods: Report and seminar presentation

Bibliography: Pelin, R., Projektihallinnan käsikirja
A Guide to the Project Management Body of Knowledge
Lecture handouts

STUDIES IN MATHEMATICS AND SCIENCE 36 cr

This module provides the mathematical skills required in engineering subjects.

(TTPM2Z) MATHEMATICS 18 cr

(TTPM007) Algebra

Credits: 3 cr Timing: 1st yr

Learning Objectives: To partly review and add to high school and vocational college mathematics, with the adoption of disciplined and determined working methods and to develop interaction skills.

Contents: Number sets and calculations
Expressions and functions
Equations and systems of equations
Exponential function and logarithms
Introduction to a mathematics programme

Learning Methods: Lectures and exercises. Individual and group work

Assessment Methods: To be announced

Bibliography: Majaniemi, A., Algebra I
Majaniemi, A., Algebra II
Henttonen, J., Peltomäki, J., Uusitalo, S., Tekniikan matematiikka 1

(TTPM008) Geometry

Credits: 3 cr Timing: 1st yr

Learning Objectives: To partly review and add to high school and vocational college mathematics, with

the adoption of disciplined and determined working methods and to develop interaction skills.

Contents: Geometry of the most common plane figures
Trigonometry
Vectors
Determinants and matrixes
Complex numbers
Introduction to a mathematics programme

Learning Methods: Lectures and exercises. Individual and group work

Assessment Methods: To be announced

Bibliography: Majaniemi, A., Algebra I
Majaniemi, A., Geometria
Henttonen, J., Peltomäki, J., Uusitalo, S., Tekniikan matematiikka 1

(TTPM005) Differential and Integral Calculus

Credits: 6 cr Timing: 2nd yr

Learning Objectives: In addition to possessing calculation skills students will understand the points of departure of differential and integral calculus, being able to apply them in engineering.

Contents: Review of basic algebra calculations
Derivative and function growth rate
Examination of function graphs
Extreme values
Indefinite and definite integral
Surface area, volume and work
Applications in engineering

Learning Methods: Lectures and exercises. Individual and group work. Use of mathematics programme

Assessment Methods: To be announced

Bibliography: Majaniemi, A., Matematiikka I
Henttonen, J., Peltomäki, J., Uusitalo, S.,Tekniikan matematiikka 2

(TTPM006) Mathematics for Information Technology

Credits: 6 cr Timing: 2nd yr

Learning Objectives: Students will be able to use their differential and integral calculus skills in mathematics related to information transfer and processing.

Contents: Selected parts from the following topics:
Differential equations
Laplace transformation
Power series
Fourier's series and transformation
Numeric methods
Probability and statistics

Learning Methods: Lectures and exercises. Individual and group work. Use of mathematics programme

Assessment Methods: To be announced in the course plan and at the beginning of the course

Bibliography:
Majaniemi, A., Matematiikka II
Majaniemi, A., Matematiikka IV
Majaniemi, A., Sarjaoppia.
Majaniemi, A., Fourier, Laplace ja Runge-Kutta-menetelmistä
Henttonen, J., Peltomäki, J., Uusitalo, S.,Tekniikan matematiikka 2

(TTPF3Z) PHYSICS 15 cr

(TTPF006) Physics 1

Credits: 3 cr Timing: 1st yr

Learning Objectives: To provide competence in physics required for other courses in this field of education.

Contents:
Physics quantity and unit system
Motion theory, motion energy theory
Function, power and energy
Momentum and quantity of motion

Learning Methods: Lectures and exercises

Assessment Methods: Interim exams

Bibliography: Inkinen, P., Tuohi, J., Momentti 1, Insinöörifysiikka

(TTPF007) Physics 2

Credits: 4 cr Timing: 1st yr

Learning Objectives: To provide competence in physics required for other courses in this field of education.

Contents:
Circular and rotary motion
Gravitation
Static equilibrium
Mechanics of fluids and gases
Thermology

Learning Methods: Lectures and exercises

Assessment Methods: Interim exams

Bibliography: Inkinen, P., Tuohi, J., Momentti 1, Insinöörifysiikka

(TTPF008) Physics 3

Credits: 5 cr Timing: 2nd yr

Learning Objectives: To provide competence in physics required for other courses in this field of education.

Contents:
Electrostatics
Magnetic fields
Electromagnetic induction
Oscillating motion, mechanical wave motion
Electric oscillation
Optics, photometry
Quantum physics

Learning Methods: Lectures and exercises

Assessment Methods: Interim exams

Bibliography: Inkinen, P., Manninen, R., Tuohi, J.,Momentti 2, Insinöörifysiikka

(TTPF003) Physics, Laboratory Work

Credits: 3 cr Timing: 2nd yr

Learning Objectives: Students will become conversant with basic physics through experimentation. The course also covers measurement technology and written reporting.

Contents: Topics covered during Physics 1 and 2

Learning Methods: Completion of laboratory work and written reporting in small groups

Assessment Methods: Completion of set assingments and reports for assessment (1 - 5)

Bibliography:
Instructions provided by polytechnic
Inkinen, P., Tuohi, J., Momentti 1 ja 2,
Insinöörifysiikka
Inkinen, P., Manninen, R., Tuohi, J., Momentti 2, Insinöörifysiikka

(TTPC4Z) CHEMISTRY 3 cr

(TTPC001) Chemistry

Credits: 3 cr Timing: 3rd yr

Learning Objectives: This course revises and adds to high school chemistry. Students will gain knowledge of environmental chemistry and study the use of dangerous materials and poisons.

Contents:
The periodic table, mol
Chemical reactions
Energy
Acid-alkali theory
pH
Electrolysis
Corrosion
Environmental chemistry
Dangerous materials and pollutants

Learning Methods: Lectures and course work

Assessment Methods: To be announced

Bibliography: Arvonen, H., Levonen, A., Ammattikorkeakoulun kemia
Handouts

PROFESSIONAL STUDIES

(TTAK1Z) ENGLISH LANGUAGE AND COMMUNICATION STUDIES 4 cr

(TTAK004) Intercultural Skills in ICT

Credits: 1.5 cr Timing: 3rd yr

Learning Objectives: ICT students will develop their intercultural communication competence so that they can recognise cultural differences, understand them and adjust their communication style as the situation requires.

Contents: Cultural differences in communcation
Variables used to compare cultures
Cultural differences in communication
The process of adjusting to an unfamiliar culture

Learning Methods: Contact teaching, exercises, independent work, pair and group work

Assessment Methods: Active participation, project work and oral presentation

Bibliography: Course handout

(TTAK005) Business English for ICT

Credits: 2.5 cr Timing: 4th yr

Learning Objectives: ICT students will apply their intercultural communication competence and deepen their ability to interact using spoken and written English in international and multicultural working life.

Contents: Company, production and product presentations
Telephoning
Written communication
Meetings and negotiations

Learning Methods: Contact teaching, exercises, independent study, pair and group work

Assessment Methods: Active participation, spoken and written exercises

Bibliography: Course handout

(TTAO0Z) PROGRAMMING 12 cr

(TTAO006) An Introduction to Programming

Credits: 3 cr Timing: 1st yr

Learning Objectives: Students will be proficient in basic computer programming skills and techniques.

Contents: Programming and computer programme planning
Basics of C# language and VisualStudio

Learning Methods: Blended teaching: lectures, supervised and independent exercises

Assessment Methods: Exam and assignment

Bibliography: As indicated by the teacher

(TTAO007) Object Oriented Programming

Credits: 3 cr Timing: 1st yr

Learning Objectives: Students will understand the basic concepts of object-oriented programming being able to apply them in software planning and implementation.

Prerequisite: Introduction to Programming

Contents: Object-oriented programming, classes and objects, inheritance and class diagrams

Learning Methods: Lectures and exercises

Assessment Methods: Exam and assignment

Bibliography: As indicated by the teacher

(TTAO008) Programming C++

Credits: 3 cr Timing: 1st yr

Learning Objectives: Students will be proficient in the basics of C++ and be able to use ready class libraries.

Prerequisite: Introduction to Programming Introduction to Object-Oriented Programming

Contents: Principles, data types, classes, dynamic memory management, STL

Learning Methods: Lectures and exercises

Assessment Methods: Exam and assignment

Bibliography: As indicated by the teacher

(TTAO009) Programming in C++, Advanced Course

Credits: 3 cr Timing: 3rd yr

Learning Objectives: Students will gain basic knowledge of object-oriented software planning and UML modelling as well as creating plans using C++.

Prerequisite: C++ Programming

Contents: Software development stages:
From specifications to planning
From planning models to implementation
UML Modelling
C++ object oriented programming

Learning Methods: Blended teaching: lectures, supervised and independent exercises

Assessment Methods: Exam, exercises and assignment

Bibliography: To be announced

(TTAE0Z) ELECTRONICS 16 cr

(TTAE003) Circuit Analysis

Credits: 6 cr Timing: 1st yr

Learning Objectives: Students will know the basic magnitudes of electrical circuits and be able to apply basic laws to examine the properties of direct and alternating current circuits. Students will be proficient in understanding the interactions between electrical magnitudes and will learn to recognise how they behave in electrical circuits and in vehicle electronics connections.

Contents: Direct current, Ohm's law, Kirchoff's laws, Power
Current circuit solution methods, basic law method, loop method, node method, bridge connections
Introduction to circuit simulation programmes
Induction phenomenon, counter-inductive effect
Alternating quantities, indicator diagram, impedance
Understanding alternating current circuits
Mutual induction in alternating current circuits
Resonance circuits
Passive filters

Learning Methods: Lectures and small group teaching/exercises

Assessment Methods: To be announced

Bibliography: Tarkka, P., Määttänen, K., Hietalahti, L., Piirianalyysi 1 ja 2
Aura, L., Tonteri, A., Sähkömiehen käsikirja

(TTAE004) Analogue Electronics 1

Credits: 6 cr Timing: 1st yr

Learning Objectives: Students will be conversant with the basic electronic components and connections involved in analogue electronics, being able to apply the basic laws of electronics to small scale connections.

Contents: Passive components and filters
Types of diodes, diode response curves and basic connections
Calculating bipolar and field-effect transistor operating points and basic connections

Basic connections of operation amplifiers
An introduction to computer aided simulation methods (Micro-Cap)
The basic structure of CMOS logic circuits

Learning Methods: Lectures, exercises and demonstrations

Assessment Methods: Interim exams

Bibliography: Silvonen, K., Tiilikainen, M., Helenius, K., Analogiaelektroniikka
Volotinen, V., Analoginen elektroniikka, Komponentit ja peruskytkennät
Salo, P., Sähkötekniikan perusoppi 4, elektroniikka 1
Salo, P., Sähkötekniikan perusoppi 5, elektroniikka 2
Salo, P., Analogista elektroniikkaa, Periaatteita ja sovellutuksia

(TTAE005) Analogue Electronics 2

Credits: 4 cr Timing: 2nd yr

Learning Objectives: Students will know the functioning principles of basic electronics connections and will able to plan electronics appropriate for use in vehicles.

Prerequisite: Analogue Electronics 1

Contents: The functioning principles and most common components of basic connections, function-related solutions and features
Power source engineering
Thermal planning
The basics of electronics design
The basics of computer aided design

Learning Methods: Lectures and exercises

Assessment Methods: Interim tests and assignments

Bibliography: Lecture handouts
Silvonen, K., Tiilikainen, M., Helenius, K., Analogiaelektroniikka
Volotinen, V., Analoginen elektroniikka, Komponentit ja peruskytkennät
Salo, P., Sähkötekniikan perusoppi 4, elektroniikka 1
Salo, P., Sähkötekniikan perusoppi 5, elektroniikka 2
Salo, P., Analogista elektroniikkaa, Periaatteita ja sovellutuksia

(TTAD4Z) COMPUTER TECHNOLOGY 12 cr

Students will be competent in planning devices based on microprocessor technology.

(TTAD003) Digital Engineering

Credits: 6 cr Timing: 1st yr

Learning Objectives: Students will be proficient in the basics of digital engineering and components and will be proficient in designing and analysing digital connections.

Contents: Number systems
Boolean algebra

Digital electronics
Combinational logic
Basics of sequential logic
Sequential logic
Synchronous state machine

Learning Methods: Lectures and exercises

Assessment Methods: Interim tests

Bibliography: Rantala Pekka, Digitaalitekniikka
Piirikohtaiset manuaalit

(TTAD004) Microprocessor Engineering

Credits: 6 cr Timing: 2nd yr

Learning Objectives: Students will be proficient in the structural parts and functioning principles of a microprocessor system while being able to understand how a processor based device for use in vehicles works.

Prerequisite: Digital Engineering

Contents: Basic structure of a computer
Memory circuits
Selection of circuit
How microprocessors and the main I/O circuits work
Programming using Assembly or C language

Learning Methods: Lectures and exercises

Assessment Methods: Interim tests

Bibliography: Piiri- ja anturikohtaiset manuaalit
Rantala Pekka, Mikrotietokonetekniikka
Intel, MCS-51:n manuaalit

(TTAL0Z) TELECOMMUNICATIONS 14 cr

(TTAL003) Basics of Telecommunications Engineering

Credits: 6 cr Timing: 2nd yr

Learning Objectives: Students will gain a general overview of different telecommunications systems, how they work and their technical limitations

Contents: Concepts
Signal, noise; basics of information theory and encryption.
Structures of data communications systems
Basics of data transfer
Basics of wireless systems
Routes
Basics of information networks

Learning Methods: Lectures and written assignments

Assessment Methods: Exam

Bibliography: Lecture handout

(TTAL004) Basics of EMC

Credits: 3 cr Timing: 4th yr

Learning Objectives: Students will understand the basics of EMC and be able to protect vehicle devices against large fields of interference and transients.

Prerequisite: Telecommunications Engineering Telecommunications Laboratory Work

Contents: Basics of transmission lines and EM wave motion and progression. Basic structures of antennas.
E and M fields
Conducted and radiated interference and how to measure such interference
How interference becomes connected
Protection against interference

Learning Methods: Lectures and laboratory work

Assessment Methods: Exam. Approved laboratory assignments

Bibliography: Lecture handouts

(TTAL005) Basics of Signal Processing

Credits: 5 cr Timing: 3rd yr

Learning Objectives: Students will be conversant with signals and basic methods of signal processing while learning to use them in practice.

Contents: Describing signals
Complex numbers
Processing continuous time signals
Linear systems
Processing discrete time signals
Signal processing applications

Learning Methods: Lectures and exercises Introduction to signal processing software

Assessment Methods: Interim tests

Bibliography: Study handout

(TTAC0Z) PROFESSIONAL SUBJECTS, LABORATORY WORK 17 cr

(TTAC001) Laboratory Work, Basics

Credits: 3 cr Timing: 1st yr

Learning Objectives: Students will be conversant with the use of basic measurement devices and how to build simple electronic and digital connections.

Prerequisite: Electronics 1 and Digital Engineering Theory

Contents: Measurement device orientation and implemetation of basic measurements
Building and testing basic electronic connections
Combinational and sequential logic circuit connections
An introduction to circuit planning programmes (Micro-Cap)

Learning Methods: Laboratory work in small groups

Assessment Methods: Laboratory work, written reports and laboratory test (assessment 1 - 5)

Bibliography: Rantala Pekka, Digitaalitekniikka
Elektronics 1 - material
Component data pages
Measurement device manuals

(TTAC007) Analogue Electronics Laboratory Work

Credits: 5 cr Timing: 2nd and 3rd yr

Learning Objectives: Students will be able to carry out measurements on basic analogue electronic components and vehicle sensors, as well as building up connections and measuring their basic features using standard measurement equipment. Students will be proficient in planning, building, measuring and reporting on connection configurations consisting of several functions.

Prerequisite: Introduction to Laboratory Work Analogue Electronics 1

Contents: Planning, creating, measuring and written report of connections

Learning Methods: Small group teaching, included in RDI studies

Assessment Methods: Lab work, written reports and exam

Bibliography: Analogue electronics lecture handouts and literature

(TTAC008) Microprocessor Engineering Laboratory Work

Credits: 5 cr Timing: 2nd and 3rd yr

Learning Objectives: Students will learn to plan a processor based board and to use programming tools.

Prerequisite: Digital Technology, Introduction to Laboratory Work

Contents: Introduction to device oriented programming tools
Programming with Assembly and C-language
Introduction to vehicle sensors
The assignments include planning, constructing, programming and testing a processor based board.

Learning Methods: Small group teaching

Assessment Lab work, written reports and exam

Methods:

Bibliography: Piiri- ja anturikohtaiset manuaalit
Rantala Pekka, Mikrotietokonetekniikka
Intel, MCS-51:n manuaalit
(circuit and sensor manuals)

(TTAC009) Communications Laboratory Work

Credits: 2 cr Timing: 3nd yr

Learning Objectives: To deepen students' understanding of communications equipment and systems and short range communications devices.

Prerequisite: Communications Technology (during course)

Contents: Laboratory work
Different areas of communications engineering.

Learning Methods: Small group teaching through laboratory work

Assessment Methods: Approved lab reports

(TTAC010) Basics of Circuit Board Design

Credits: 2 cr Timing: 3rd yr

Learning Objectives: Students will know how to plan a circuit board using a circuit plan and will be able to apply their skills in creating their own product.

Contents: Circuit plans using a design programme and circuit boards made according to the plan.
Introduction to component library editing, creating a new component, elimination of interference, dimensioning different types of piece work and manufacturing proto-boards.

Learning Methods: Lectures, exercises, proto-board planning

Assessment Methods: Exam and practical proto-board assignment

OPTIONAL PROFESSIONAL STUDIES

Students will select one of the following modules. For further information on these modules please consult your study supervisor and lecturers.

(TTVA3Z) VEHICLE DATA SYSTEMS/SHARED COURSES 25 cr

(TTVA001) Basics of Measurement Technology

Credits: 3 cr Timing: 2nd yr

Learning Objectives: Students will be proficient in basic electronic measurements and the associated fault

and interference factors.

Contents: Measuring scales, measurement errors
SI system, measurement standards, calibration
General digital measurement device, oscilloscopes
Interferences associated with measuring
The most common sensors
Automation of measuring

Learning Methods: Lectures and exercises

Assessment Methods: Interim tests

Bibliography: Aumala, O., Mittaustekniikan perusteet
Lecture handout

(TTVA002) Information Networks and Buses

Credits: 2 cr Timing: 2th yr

Learning Objectives: Students will understand the topology, functioning principles and their limitations of different information carriers.

Prerequisite: Telecommunications

Contents: The most significant information networks and their frameworks. Ehternet. TCP/IP and its applications. The main vehicle information carriers.
CAN

Learning Methods: Lectures and exercises Small group teaching

Assessment Methods: Exam, approved assignments

Bibliography: Lecture handouts

(TTVA003) Introduction to Testing

Credits: 2 cr Timing: 2nd yr

Learning Objectives: Students will adopt the basic principles of testing embedded systems.

Contents: The aim of testing.
Testing products at different stages of their life-cycle

Learning Methods: Lectures and exercises

Assessment Methods: Exam and assignment

Bibliography: To be announced

(TTVA004) Embedded Systems Programming and Tools

Credits: 2 cr Timing: 2nd yr

Learning Objectives: Students will be able to programme processor-based embedded devices, use simulators and debuggers. They will also be able to produce code that generates documents automatically. They will be proficient in the use of the SVN version management tool as part of software development.

Contents: Programming tools, debuggers and simulators. Code documentation and version management

Learning Methods: Lectures and supervised exercises

Assessment Methods: Exam and learning diary based on exercises

Bibliography: To be announced

(TTVA005) Systems-on-Chip (SoC) Programming (VHDL)

Credits: 4 cr Timing: 4th yr

Learning Objectives: Students will adopt the principles of planning and creating a FPGA device

Contents: Planning methods and tools
ModelSim software for model creation using VHDL language and simulating and testing functions

Learning Methods: Lectures and supervised exercises

Assessment Methods: Exam, exercises and assignment

Bibliography: To be announced

(TTVA011) Product Development Laboratory Work/1

Credits: 3 cr Timing: 2nd yr

Learning Objectives: Students will know how to create an embedded device on a ready development platform.

Prerequisite: Introduction to Vehicle Information Systems Introduction to Product Development Project planning

Contents: Introduction to device-oriented programming tools
1:LabVIEW programming environment
2: Embedded systems development platforms

Learning Methods: Lectures and group teaching

Assessment Methods: Laboratory work, exercises and written reports

(TTVA009) Product Development Laboratory Work/2

Credits: 3 cr Timing: 3rd yr

Learning Objectives: Students will be able to transfer solutions from a development platform to their own product and further develop equipment. The aim is to plan and create a prototype.

Prerequisite: Product Development Laboratories/Laboratories 1 (own product project)

Contents: Creation of a embedded device prototype
Development of software for the device
Addition of device's electronics and if required, mechanical planning

Learning Methods: Small group teaching

Assessment Methods: Laboratories, exercises and written reports.

Bibliography: Circuit and sensor manuals
Lecture handouts

(TTVA012) Product Development Laboratory Work/3

Credits: 6 cr Timing: 4th yr

Learning Objectives: Students will prepare a product for production from their product prototype.

Prerequisite: Product Development Laboratories/Laboratories 2 (Own product project)

Contents: Development of an embedded device, its documentation and testing

Learning Methods: Small group teaching

Assessment Methods: Laboratories, written reports, seminar presentation

Bibliography: Circuit and sensor specific manuals and standards for this field

(TTVO0Z) VEHICLE DATA SYSTEMS/SOFTWARE ENGINEERING 16 cr

(TTVO001) Windows Programming

Credits: 3 cr Timing: 4th yr

Learning Objectives: Students will be proficient in the basics of Windows programming and hardware handling.

Prerequisite: Real-Time Operating Systems

Contents: Windows programming with Visual Studio
Using information networks
Hardware handling in Windows

Learning Methods: Lectures and supervised exercises

Assessment Methods: Exam, exercises and assignment

Bibliography: To be announced

(TTVO002) Realtime Operating Systems

Credits: 4 cr Timing: 4th yr

Learning Objectives: Students will be able to design, test and make real-time systems according to real-time standards using operating systems.

Contents: Real-time operating systems

Learning Methods: Lectures and supervised exercises

Assessment Methods: Exam, exercises and assignment

Bibliography: To be announced

(TTVO003) Telecommunications Programming

Credits: 3 cr Timing: 4th yr

Learning Objectives: Students will be proficient in designing and making basic telecommunications applications using vehicle busses.

Prerequisite: Embedded Device Programming and Tools

Contents: Protocol design and implementation

Learning Methods: Lectures and supervised exercises

Assessment Methods: Exam, exercises and assignment

Bibliography: To be announced

(TTVO004) Data Structures and Algorithms

Credits: 3 cr Timing: 4th yr

Learning Objectives: Students will understand the importance of using ready algorithms and be able to apply the most common algorithms.

Prerequisite: C++ Programming

Contents: Basics of applying ready algorithms
The most common algorithms:
Stacks, strings and linkaged lists
Tree structures
Significance of algorithm class of difficulty, assessment and measurement

Learning Methods: Lectures, supervised and independent exercises

Assessment Methods: Exam and assignment

Bibliography: To be announced

(TTVO005) Smart Systems

Credits: 3 cr Timing: 4th yr

Learning Objectives: Students will understand the functioning of systems based on artificial intelligence and the architecture used to create them.

Prerequisite: Data Structures and Algorithms

Contents: Introduction to artificial intelligence
Route finder agents and navigation
A system that learns

Learning Methods: Lectures and supervised exercises

Assessment Methods: Exam, exercises and assignment

Bibliography: To be announced

(TTVM0Z) VEHICLE DATA SYSTEMS/MEASUREMENT TECHNOLOGY DESIGN 16 cr

(TTVM001) Planning Testing and Fault Diagnosis

Credits: 2 cr Timing: 4rd yr

Learning Objectives: Students will be proficient in the main testing and fault diagnosis methods used for embedded systems and in applying these methods.

Contents: Testing plan
Fault diagnosis plan

Learning Methods: Lectures and exercises

Assessment Methods: Exam and assignment

Bibliography: To be announced

(TTVM002) Planning EMC and Environmental Testing

Credits: 2 cr Timing: 4th yr

Learning Objectives: Students will be proficient in the basic principles of EMC and environmental testing of embedded systems and able to compile the appropriate testing plans.

Contents: EMC testing and environmental testing methods.
EMC test plan and test implementation
Environmental test plan and test implementation

Learning Methods: Lectures and assignments

Assessment Methods: Exam and assignments

Bibliography: To be announced

(TTVM003) Microcontroller System Design

Credits: 4 cr Timing: 3rd yr

Learning Objectives: Students will be proficient in designing a vehicle microprocessor based system product

Prerequisite: Analogue Electronics 1 and 2 Digital Technology Microprocessor Technology

Contents:
Awareness of EMC requirements in all stages of device design
Planning of own electronics for own device
Multilayer printed board design
Thermal planning
Reliability technology
Using simulators and existing simulated models in design
Power feed planning

Learning Methods: Lectures and exercises, planning of electronics for own product project

Assessment Methods: Interim tests and assignments

Bibliography:
Lecture handouts
Study material from Analogue Electronics and Microprocessor Technology

(TTVM004) Sensor and Interface Electronics

Credits: 4 cr Timing: 3rd yr

Learning Objectives: Students will be conversant with the most common sensors and will learn to design the connection electronics required in their use.

Contents:
The basic features of sensors
Measuring mechanical quantities, temperature, pressure and humidity
Measuring flow speed
Measuring luminosity
Micro-sensors
Connecting electronics required in sensors

Learning Methods: Lectures and exercises

Assessment Methods: Interim tests

(TTVM005) LabVIEW Programming and Applications

Credits: 4 cr Timing: 4th yr

Learning Objectives: Students will know the basic structures of the LabVIEW programming language and will be able to use this language when creating measurement applications.

Contents:
Basic structures of the LabVIEW language
Applications in data logger boards, bus connected measurement devices and real-time systems
Applications in digital sensors

Learning Methods: Lectures and supervised exercises, group work

Assessment: Exercises and assignments

Methods:

Bibliography: LabVIEW Basics, Hands-On Course
Study handout

(VAPAAZ) FREE-CHOICE STUDIES 15 cr

Students can freely select 15 cr of studies that will support their professional development, from their own field/degree programme or from another degree programme in their own university of applied sciences, from another university of applied sciences or science university. Students will achieve wide-ranging expertise.

(TRW015) Build up Your English

Credits: 3 cr Timing: 1st yr

Learning Objectives: Students will develop and strengthen their language skills acquired during previous courses in order to be able to cope with their compulsory professional language studies. The aim is also to develop language learning skills.

Prerequisite: Proficiency test

Contents: Basic grammar and vocabulary
Activation of speaking and writing skills as well as reading and listening comprehension.

Learning Methods: Contact teaching

Assessment Methods: Active participation, exercises

Bibliography: Text book and/or handout

(TRW016) Bygg Upp Din Svenska

Credits: 3 cr Timing: To be announced

Learning Objectives: This course develops and strengthens Swedish skills acquired during earlier courses so that students will be able to cope with UAS level compulsory Swedish language studies in their own field of studies. The aim is also to develop language study skills.

Prerequisite: Proficiency test

Contents: Basic grammar and vocabulary.
Activating speaking and writing skills as well as listening and reading comprehension.

Learning Methods: Supervised exercises

Assessment Methods: Active participation 100 %, exam

Bibliography: Handout

(TYW076) Electric Car Technology

Credits: 4 cr Timing: 3rd and 4th yr

Learning Objectives: Students will be able to assess the social effects of the widespread use of electric cars while understanding how an electric or hybrid vehicle works. With the aid of competences provided during this and the Planning Embedded Systems course, they will be able to plan electronic units required in electric vehicles.

Prerequisite: Competence in electronics recommeded

Contents:
Use of electric cars and society
Principles of vehicle engineering
Batteries
Charging systems
Electric motors
Engine control systems
Braking energy retention

Learning Methods: Lectures Assignments Project work Included in RDI studies

Assessment Methods: Exams Assignments and project work

Bibliography: Lecture handouts

(TYW077) Electrical Power Engineering

Credits: 3 cr Timing: 3rd or 4th yr

Learning Objectives: Students will know the structure of the electricity transfer system and the basics of working safely with electricity, how the most common electrical devices work, the basics of power electronics, the most common forms of interference in the electricity network and how to eliminate them from devices.

Prerequisite: Physics of Electronics

Contents:
Power plant engineering
The structure of the electricity transfer system
Safe electrical work training course
Prices
Electric motors
Transformers
Reactive power and break in current
Components of power electronics
TRIAC power controllers
PFC technology

Learning Methods: Lectures and assignments Lab work Project assignment

Assessment Methods: Exams, lab work, assignments and project assignment

Bibliography: Lecture handouts

(TTWY020) Electronics Qualification Prep. Course

Credits: 3 cr Timing: 3rd or 4th yr

Learning Objectives: Students will be able to accomplish the Electricity Safety Certificate

Prerequisite: Physics of Electronics studies Electric Power Engineering or Power Current Engineering recommended

Contents: Electricity safety standard SFS6000
Working safely with electricity standard SFS6002
Electrical installation instructions
Safe repair of electric devices

Learning Methods: Lectures Assignments Mock exam National Electricity Safety Certificate

Assessment Methods: Attendance of lectures Mock exam

Bibliography: Certificate material from TUKES

(TYW073) Predictive Fault Diagnostics

Credits: 4 cr Timing: 2nd - 4th yr

Learning Objectives: Students will know the basic concepts and methods of predictive fault diagnostics being able to apply them to a simple electronic product.

Contents: Basic methods of fault diagnosis for electronic products at circuit, card and system level.

Learning Methods: Lectures, exercises and application to own product

Bibliography: As indicated by the teacher

(TYW074) Virtual Technologies

Credits: 5 cr Timing: 2nd - 4th yr

Learning Objectives: Students will know virtual technologies used to create virtual realities that feel real to those who experience them. Students will know the devices and systems used to produce 3D images and sound to create an artificial reality.

Contents: Devices and systems required in the creation of virtual realities (movement measurement systems, visualisation systems, 3D audio, wearable sensor systems), virtual reality modelling methods and applications

Learning Methods: Lectures and exercises

(TYW075) Machine Vision Applications

Credits: 3 cr Timing: 3rd - 4th yr

Learning Objectives: Students will know the devices used to create machine vision systems, how images are formed and digital image manipulation.

Contents: Cameras and lighting
Introduction to Vision Assistant and Vision Builder AI image manipulation software from a machine vision perspective

Learning Methods: Lectures, supervised exercises, group work

Assessment Methods: Lab work and their reports and written assignment

Bibliography: Assignment instructions and handouts

(TTWY019) The History of Engineering

Credits: 3 cr Timing: As wished

Learning Objectives: Students will understand the current situation of engineering in the light of historical development.

Contents: Main features of the engineering history from the antiquity to space time

Learning Methods: Lectures, essays, literature studies

Assessment Methods: Essays and studies

Bibliography: To be announced

(TTWY009) ANSI C -programming Language

Credits: 6 cr Timing: 3rd or 4th year

Learning Objectives: To provide students with a fundamental understanding of programming and software engineering so that they can program simple techical applications.

Contents: Introduction of C
Basic elements
Input and Output
Operators and expressions
Control statements
Functions
Pointers
Arrays
File Handling
Structures
Miscellaneous

Learning Methods: Internet/WebCT

Assessment Methods: Exam or exercises

Bibliography: To be announced

(TYW013) Abroad on Business

Credits: 1.5 cr Timing: Once/academic year.
To be announced.

Learning Objectives: Students will deepen their competences acquired from Intercultural Skills in ICT and Business English for ICT

Contents: Business trips abroad
Socializing and small talk
Talking about Finland
Travelling by air
Staying at a hotel
Eating out

Learning Methods: Contact lessons, pair and group work and presentation practice

Assessment Methods: Active participation; attendance minimum 80%; attendance will be controlled

Bibliography: Handout

(TTWY025) RFID Engineering

Credits: 4 cr Timing: 2nd - 4th yr

Learning Objectives: To provide students with basic knowledge of radio frequency ID technology

Contents: RFID tehcnology and environment
Identifiers and codes
Information transfer protocols and information security
Opportunities for using RFID technology

Learning Methods: Lectures and exercises

Bibliography: RFID guide, introduction to the technology

(TTWY002) Programming in Java

Credits: 6 cr Timing: 1st - 4th yr

Learning Objectives: The aim of this course is to provide basic programming skills in Java, in graphic programming and programming for mobile applications.

Prerequisite: Introduction to Data Processing Introduction to Programming

Contents: An introduction to programming
An introduction to programming graphics
An introduction to programming mobile applications

Learning Methods: A variety of learning strategies will be used including e-learning

Assessment Methods: To be announced

Bibliography: E-material

(TTOO0Z) THESIS 15 cr

(TTOO001) Thesis

Credits: 15 cr Timing: 4th yr

Learning Objectives: The aim of the thesis is to demonstate and develop the skills that students possess in applying their knowledge and know-how to professional studies and tasks requiring expertise in their chosen field. The topic of the thesis is usually agreed beforehand with the commissioning party and is based on the requirements of working life to support students' professional development. The thesis provides a wide-ranging demonstration of students' knowledge and know-how.

Contents: Selecting a subject from industry and commerce
Creating the necessary documents
Acceptance processes
Selecting the supervisor
Thesis
Presentation of thesis
Maturity test

Assessment Methods: Independent study, participation in supervision process

(TTHH0Z) PRACTICAL TRAINING 30 cr

(TTHH001) Practical Training

Credits: 30 cr Timing: 3rd yr/spring

Learning Objectives: The aim of the practical training period is to provide students with good post graduation employment opportunities and to familiarise students with working life. Students will gain knowledge of different job tasks, working procedures, devices and professional terminology related to their chosen specialism in a real working environment under supervision.

Prerequisite: Students must have 112 cr before starting their practical training period.

Contents: A usually continuous approx five month training period (800 working hours) in working life

DEGREE PROGRAMME IN INFORMATION TECHNOLOGY

Information systems competence area

The Information Systems competence area consists of the degree programme in Information Technology (Bachelor of Engineering) and the degree programme in Business Information Technology (Bachelor of Business Administration) and it is a part of the CEMIS expertise centre which aims to improve the competitiveness, attraction, quality and influence of education, research and development operations. There are similarities in the content of the Information Technology and Business Information Technology degree programmes. Therefore these content areas will be delivered in courses shared by both degree programmes.

Vehicle information systems

During this degree programme students will design, build and programme smart electronics required in vehicles, industrial measuring devices or for different telecommunications applications such as mobile phones and mobile terminal and control devices. During their studies students will carry out a product project in small groups using the versatile laboratory environments available on campus, ensuring a practical, hands-on approach.

The competences covered in the Information Technology Degree Programme

Information Technology Degree Programme	Description of range of competence
Competence in mathematics and natural sciences	• able to use a mathematical and logical approach and way of thinking in technical problem solving • ability to use mathematical principles, methods and tools • awareness of important physical properties of applications and the principles of sustainable development
Hardware competence	• Is conversant with the functioning and development environments of different vehicle information systems • Is proficient in electrical engineering measurements • Understands the electronics design and production process • Knows the most important electronic components, how they work and basic connections • Has basic IT skills • Knows how to use simulation and design programmes
Software competence	• proficiency in programming technology; comprehension of programming logic, knowledge of the most common

	algorithms, information structures and tools • ability to interpret programming language and to use programming to solve problems • knows object-oriented design and programming basics • ability to participate in software projects in a client and company oriented manner • competence in device-oriented programming basics • knows the basics of data communication application planning and programming
Information technology design competence	• possesses knowledge of the theoretical foundations of vehicle information systems • ability to find, combine and apply the latest technical knowledge of own field using typical design methods and procedures and ability to document the results of one's own work • ability to participate in disciplined product development work independently and as a member of a team
Measuring systems competence	• comprehension of the general structure of a measurement system • knowledge of measuring systems of basic electrical magnitudes • comprehension of the statistical nature of measurements and questions relating to their reliability • knowledge of disturbances in measuring • knowledge of the sensors used to measure the most common quantities and ability to create the electronic solutions used in them • ability to create measurement systems using graphical programming environments
Signal processing competence	• Will know the basic principles related to signals • Will know basic signal conversions • conversant in basic signal editing methods • Will know how to convert different signals • Will know how to use signal processing to produce digital filters
Applied electronics competence	• Will be able to design, test and document electronic applications based on microcontrollers, for demanding conditions

	(vehicle and industrial) • Will be conversant with circuit, unit and device-level testing and fault diagnostics methods, being able to apply them • will be conversant with basic information transfer methods of vehicle and industrial applications
Product development competence (Own product project)	• will understand client-oriented product development • will be conversant with the different stages of product development and will understand the significance of project planning and documentation • will be able to operate within different product development roles in different projects and understand the demands of these different roles • will be conversant with product and product development quality control methods • proficient in long-term, methodical work within product development • will be proficient in the basic legislation and immaterial rights of product development

THEMES FOR EACH YEAR OF STUDY

1st yr

Orientation
This theme covers the development of the basic knowledge, mathematical and natural sciences thinking processes, and communication and information retrieval skills required during engineering studies.

2nd yr
K**nowledge Acquisition**

This theme includes the supplementation of basic skills and knowledge and choosing major courses of study. It also covers group work skills and introduces project working methods.

3rd yr

Specialisation and practical training

Students will gain specialised knowledge of their major subject and learn to apply theory in practice through participation in working life.

4th yr

Specialisation and application

This theme includes the supplementing of existing skills and knowledge for the requirements and transfer into the world of work. Students will learn to work independently in typical engineering positions.

INFORMATION TECHNOLOGY DEGREE PROGRAMME

BASIC STUDIES	**64 cr**
COMMUNICATION SKILLS	**15 cr**
Finnish Language and Communication	5 cr
English	4 cr
Swedish	3 cr
Introduction to Data Processing	3 cr
PRODUCT DEVELOPMENT	**13 cr**
Introduction to Vehicle Data Systems	1 cr
Introduction to Product Development Project Planning	3 cr
Introduction to Project Economics	3 cr
Introduction to Product Development Legislation	3 cr
Project Leadership	3 cr
STUDIES IN MATHEMATICS AND NATURAL SCIENCES	**36 cr**
Mathematics	18 cr
Physics	15 cr
Chemistry	3 cr
COMPULSORY PROFESSIONAL STUDIES	**75 cr**
English Language and Communication Skills	4 cr
Programming	12 cr
Electronics	16 cr
Computer Technology	12 cr
Telecommunications Technology	14 cr
Professional Subjects, Laboratory Work	17 cr
VEHICLE DATA SYSTEMS	**41 cr**
Common studies	25 cr
OPTIONAL PROFESSIONAL STUDIES	
Measurement Electronics Design	16 cr
Software Engineering	16 cr

FREE-CHOICE STUDIES	**15 cr**
PRACTICAL TRAINING	**30 cr**
THESIS	**15 cr**

COURSE DESCRIPTIONS FOR THE DEGREE PROGRAMME IN INFORMATION TECHNOLOGY

BASIC STUDIES

(TTPV2Z) LANGUAGE AND COMMUNICATION SKILLS 15 cr

(TTPV008) Communication Skills in Finnish 1

Credits: 3 cr Timing: 1st yr

Learning Objectives: Students will practise oral and written communication required in working life and their chosen profession.

Contents: An introduction to oral and written communication
Academic writing
Situations requiring oral communication (preparation, participation, analysis)
Introduction to team work, negotiation situations and meetings

Learning Methods: Independent work, group work, supplementary lectures

Assessment Methods: Participation in group work, assignments, exam and portfolio

Bibliography: Kauppinen, A., Nummi, J., Savola, T., Tekniikan viestintä (10., uudistettu painos)

(TTPV009) Communication Skills in Finnish 2

Credits: 2 cr Timing: 4th yr

Learning Objectives: Students will learn technical writing skills.

Contents: Documentation of the engineering thesis
Technical writing
Language issues

Learning Methods: Independent work, group work, supplementary lectures

Assessment Methods: Participation in group work, assignments and exam

Bibliography: Kauppinen, A., Nummi, J., Savola, T., Tekniikan viestintä (10., uudistettu painos)
Nykänen, O., Toimivaa tekstiä. Opas tekniikasta kirjoittaville.

(TTPV014) Basics of ICT English

Credits: 1.5 cr Timing: 1st yr

Learning Objectives: ICT students will be able to read professional texts related to their field of studies and write technical documents.

Prerequisite: Proficiency test and Build up Your English course if required

Contents: Technical English as a tool
The special grammatical features of technical English
Building of vocabulary for own engineering field
Development of reading techniques
Documentation practice

Learning Methods: Contact teaching, independent work, pair and group work

Assessment Methods: Active participation, exercises, written exam

Bibliography: Course handout

(TTPV015) Advanced ICT English

Credits: 2.5 cr Timing: 2nd yr

Learning Objectives: ICT students will be able to read professional technical literature, write technical documents and search for and process information concerning their field of studies.

Contents: Special grammatical features of technical language
Building of vocabulary for own engineering field
Development of reading techniques
Documentation practice
Spoken and written reporting and summarizing

Learning Methods: Contact teaching, independent work, pair and group work

Assessment Methods: Active participation, searching for technical texts, processing and oral presentations

Bibliography: Students' processed texts 5-0

(TTPV013) Svenska för fordonsingenjörer

Credits: 3 cr Timing: 3rd yr

Learning Objectives: Students will develop their oral and writing skills in Finland's second official language for use in their chosen professional field.

Contents: Vehicle technology central vocabulary and language use situations

Learning Methods: Supervised exercises

Assessment Methods: Active participation (100 %), oral and written exercises, written exam

Bibliography: Ledtråd till teknisk svenska: Maskin- Bil- El- Elektronik- IT

(TTPV007) Data Processing, Basics

Credits: 3 cr Timing: 1st yr

Learning Objectives: Students will be conversant with basic IT and data security. They will know how to use the UAS computers, their most usual tools programmes and peripheral devices used during studies.

Contents: Introduction to IT
Kajaani UAS information system
Directory structure
Information security
Word processing
Presentation graphics
Spreadsheet accounting
Health and the work environment

Learning Methods: Contact and online teaching

Assessment Methods: Exam and online assignments

Bibliography: Reading list/material provided by lecturer

(TTPK0Z) PRODUCT DEVELOPMENT 13 cr

(TTPK001) Introduction to Vehicle Information Systems

Credits: 1 cr Timing: 1st yr

Learning Objectives: Students will gain an overview of how vehicles work and of vehicle information systems on a practical level.

Contents: Overview of vehicle engineering
Route technology device solutions
Introduction to companies in the area
Practical exercises - how does a vehicle work?

Learning Methods: Contact teaching and independent work

Assessment Methods: Participation in group work and assigments

Bibliography: Lecture handouts
Online material

(TTPK002) The Basics of Project Finance

Credits: 3 cr Timing: 1st yr

Learning Objectives: Students will understand the concept of project finance and the importance of cost control in project work. Students will be proficient in product development procedure and be able to apply this knowledge in their own product development project.

Prerequisite: Introduction to Product Development Project

Contents: Project cost control
Effective time management
Sourcing management
Product development procedure
Customer oriented product development
Determining customer needs and standards
Commodification of the project

Learning Methods: Lectures and exercises

Assessment Methods: Exam and compilation of standards and project plan update

Bibliography: Pelin, R., Projektihallinnan käsikirja
A Guide to the Project Management Body of Knowledge
Lecture handouts

(TTPK003) The Basics of Product Development Project

Credits: 3 cr Timing: 1st yr

Learning Objectives: Students will be proficient in the concepts of project work, and its operational model as well as being able to compile a project plan. Students will be conversant with the embedded system product development process.

Prerequisite: Introduction to Vehicle Information Systems

Contents: From idea to project
Organisation and start-up
Project planning
Project time and resource management
Ending a project
Embedded system product development process

Learning Methods: Lectures, assignments

Assessment Methods: Exam, exercises and compilation of project plan

Bibliography: Pelin, R., Projektihallinnan käsikirja
A Guide to the Project Management Body of Knowledge
Lecture handouts

(TTPK004) Product Development Legislation

Credits: 3 cr Timing: 4rd yr

Learning Objectives: Students will be aware of the general tenets and effects of contract and intellectual property rights and legislation in product development.

Contents: General contract legislation
Employment contract, working time and annual holidays
Commercial technology and cooperation agreements/contracts
Intellectual property rights (IPR) in business

Learning Methods: Online and blended

Assessment Methods: Exercises and exam

Bibliography: To be announced

(TTPK005) Project Leadership

Credits: 3 cr Timing: 4th yr

Learning Objectives: Students will deepen their knowledge of project-based work, being proficient in project leadership with the ability to develop project-based activities.

Prerequisite: Introduction to project Finance

Contents: A project as a form of leadership
Interaction and working as a team in a project
Project quality control
Project risk management
Developing company project management
Professional ethics

Learning Methods: Lectures, exercises

Assessment Methods: Report and seminar presentation

Bibliography: Pelin, R., Projektihallinnan käsikirja
A Guide to the Project Management Body of Knowledge
Lecture handouts

STUDIES IN MATHEMATICS AND SCIENCE 36 cr

This module provides the mathematical skills required in engineering subjects.

(TTPM2Z) MATHEMATICS 18 cr

(TTPM007) Algebra

Credits: 3 cr Timing: 1st yr

Learning Objectives: To partly review and add to high school and vocational college mathematics, with the adoption of disciplined and determined working methods and to develop interaction skills.

Contents: Number sets and calculations
Expressions and functions
Equations and systems of equations
Exponential function and logarithms
Introduction to a mathematics programme

Learning Methods: Lectures and exercises. Individual and group work

Assessment Methods: To be announced

Bibliography: Majaniemi, A., Algebra I
Majaniemi, A., Algebra II
Henttonen, J., Peltomäki, J., Uusitalo, S., Tekniikan matematiikka 1

(TTPM008) Geometry

Credits: 3 cr Timing: 1st yr

Learning Objectives: To partly review and add to high school and vocational college mathematics, with

the adoption of disciplined and determined working methods and to develop interaction skills.

Contents: Geometry of the most common plane figures
Trigonometry
Vectors
Determinants and matrixes
Complex numbers
Introduction to a mathematics programme

Learning Methods: Lectures and exercises. Individual and group work

Assessment Methods: To be announced

Bibliography: Majaniemi, A., Algebra I
Majaniemi, A., Geometria
Henttonen, J., Peltomäki, J., Uusitalo, S., Tekniikan matematiikka 1

(TTPM005) Differential and Integral Calculus

Credits: 6 cr Timing: 2nd yr

Learning Objectives: In addition to possessing calculation skills students will understand the points of departure of differential and integral calculus, being able to apply them in engineering.

Contents: Review of basic algebra calculations
Derivative and function growth rate
Examination of function graphs
Extreme values
Indefinite and definite integral
Surface area, volume and work
Applications in engineering

Learning Methods: Lectures and exercises. Individual and group work. Use of mathematics programme

Assessment Methods: To be announced

Bibliography: Majaniemi, A., Matematiikka I
Henttonen, J., Peltomäki, J., Uusitalo, S.,Tekniikan matematiikka 2

(TTPM006) Mathematics for Information Technology

Credits: 6 cr Timing: 2nd yr

Learning Objectives: Students will be able to use their differential and integral calculus skills in mathematics related to information transfer and processing.

Contents: Selected parts from the following topics:
Differential equations
Laplace transformation
Power series
Fourier's series and transformation
Numeric methods
Probability and statistics

Learning Methods: Lectures and exercises. Individual and group work. Use of mathematics programme

Assessment Methods: To be announced in the course plan and at the beginning of the course

Bibliography:
Majaniemi, A., Matematiikka II
Majaniemi, A., Matematiikka IV
Majaniemi, A., Sarjaoppia.
Majaniemi, A., Fourier, Laplace ja Runge-Kutta-menetelmistä
Henttonen, J., Peltomäki, J., Uusitalo, S.,Tekniikan matematiikka 2

(TTPF3Z) PHYSICS 15 cr

(TTPF006) Physics 1

Credits: 3 cr Timing: 1st yr

Learning Objectives: To provide competence in physics required for other courses in this field of education.

Contents:
Physics quantity and unit system
Motion theory, motion energy theory
Function, power and energy
Momentum and quantity of motion

Learning Methods: Lectures and exercises

Assessment Methods: Interim exams

Bibliography: Inkinen, P., Tuohi, J., Momentti 1, Insinöörifysiikka

(TTPF007) Physics 2

Credits: 4 cr Timing: 1st yr

Learning Objectives: To provide competence in physics required for other courses in this field of education.

Contents:
Circular and rotary motion
Gravitation
Static equilibrium
Mechanics of fluids and gases
Thermology

Learning Methods: Lectures and exercises

Assessment Methods: Interim exams

Bibliography: Inkinen, P., Tuohi, J., Momentti 1, Insinöörifysiikka

(TTPF008) Physics 3

Credits: 5 cr Timing: 2nd yr

Learning Objectives: To provide competence in physics required for other courses in this field of education.

Contents:
Electrostatics
Magnetic fields
Electromagnetic induction
Oscillating motion, mechanical wave motion
Electric oscillation
Optics, photometry
Quantum physics

Learning Methods: Lectures and exercises

Assessment Methods: Interim exams

Bibliography: Inkinen, P., Manninen, R., Tuohi, J.,Momentti 2, Insinöörifysiikka

(TTPF003) Physics, Laboratory Work

Credits: 3 cr Timing: 2nd yr

Learning Objectives: Students will become conversant with basic physics through experimentation. The course also covers measurement technology and written reporting.

Contents: Topics covered during Physics 1 and 2

Learning Methods: Completion of laboratory work and written reporting in small groups

Assessment Methods: Completion of set assingments and reports for assessment (1 - 5)

Bibliography:
Instructions provided by polytechnic
Inkinen, P., Tuohi, J., Momentti 1 ja 2,
Insinöörifysiikka
Inkinen, P., Manninen, R., Tuohi, J., Momentti 2, Insinöörifysiikka

(TTPC4Z) CHEMISTRY 3 cr

(TTPC001) Chemistry

Credits: 3 cr Timing: 3rd yr

Learning Objectives: This course revises and adds to high school chemistry. Students will gain knowledge of environmental chemistry and study the use of dangerous materials and poisons.

Contents:
The periodic table, mol
Chemical reactions
Energy
Acid-alkali theory
pH
Electrolysis
Corrosion
Environmental chemistry
Dangerous materials and pollutants

Learning Methods: Lectures and course work

Assessment Methods: To be announced

Bibliography: Arvonen, H., Levonen, A., Ammattikorkeakoulun kemia
Handouts

PROFESSIONAL STUDIES

(TTAK1Z) ENGLISH LANGUAGE AND COMMUNICATION STUDIES 4 cr

(TTAK004) Intercultural Skills in ICT

Credits: 1.5 cr Timing: 3rd yr

Learning Objectives: ICT students will develop their intercultural communication competence so that they can recognise cultural differences, understand them and adjust their communication style as the situation requires.

Contents: Cultural differences in communcation
Variables used to compare cultures
Cultural differences in communication
The process of adjusting to an unfamiliar culture

Learning Methods: Contact teaching, exercises, independent work, pair and group work

Assessment Methods: Active participation, project work and oral presentation

Bibliography: Course handout

(TTAK005) Business English for ICT

Credits: 2.5 cr Timing: 4th yr

Learning Objectives: ICT students will apply their intercultural communication competence and deepen their ability to interact using spoken and written English in international and multicultural working life.

Contents: Company, production and product presentations
Telephoning
Written communication
Meetings and negotiations

Learning Methods: Contact teaching, exercises, independent study, pair and group work

Assessment Methods: Active participation, spoken and written exercises

Bibliography: Course handout

(TTAO0Z) PROGRAMMING 12 cr

(TTAO006) An Introduction to Programming

Credits: 3 cr Timing: 1st yr

Learning Objectives: Students will be proficient in basic computer programming skills and techniques.

Contents: Programming and computer programme planning
Basics of C# language and VisualStudio

Learning Methods: Blended teaching: lectures, supervised and independent exercises

Assessment Methods: Exam and assignment

Bibliography: As indicated by the teacher

(TTAO007) Object Oriented Programming

Credits: 3 cr Timing: 1st yr

Learning Objectives: Students will understand the basic concepts of object-oriented programming being able to apply them in software planning and implementation.

Prerequisite: Introduction to Programming

Contents: Object-oriented programming, classes and objects, inheritance and class diagrams

Learning Methods: Lectures and exercises

Assessment Methods: Exam and assignment

Bibliography: As indicated by the teacher

(TTAO008) Programming C++

Credits: 3 cr Timing: 1st yr

Learning Objectives: Students will be proficient in the basics of C++ and be able to use ready class libraries.

Prerequisite: Introduction to Programming Introduction to Object-Oriented Programming

Contents: Principles, data types, classes, dynamic memory management, STL

Learning Methods: Lectures and exercises

Assessment Methods: Exam and assignment

Bibliography: As indicated by the teacher

(TTAO009) Programming in C++, Advanced Course

Credits: 3 cr Timing: 3rd yr

Learning Objectives: Students will gain basic knowledge of object-oriented software planning and UML modelling as well as creating plans using C++.

Prerequisite: C++ Programming

Contents: Software development stages:
From specifications to planning
From planning models to implementation
UML Modelling
C++ object oriented programming

Learning Methods: Blended teaching: lectures, supervised and independent exercises

Assessment Methods: Exam, exercises and assignment

Bibliography: To be announced

(TTAE0Z) ELECTRONICS 16 cr

(TTAE003) Circuit Analysis

Credits: 6 cr Timing: 1st yr

Learning Objectives: Students will know the basic magnitudes of electrical circuits and be able to apply basic laws to examine the properties of direct and alternating current circuits. Students will be proficient in understanding the interactions between electrical magnitudes and will learn to recognise how they behave in electrical circuits and in vehicle electronics connections.

Contents: Direct current, Ohm's law, Kirchoff's laws, Power
Current circuit solution methods, basic law method, loop method, node method, bridge connections
Introduction to circuit simulation programmes
Induction phenomenon, counter-inductive effect
Alternating quantities, indicator diagram, impedance
Understanding alternating current circuits
Mutual induction in alternating current circuits
Resonance circuits
Passive filters

Learning Methods: Lectures and small group teaching/exercises

Assessment Methods: To be announced

Bibliography: Tarkka, P., Määttänen, K., Hietalahti, L., Piirianalyysi 1 ja 2
Aura, L., Tonteri, A., Sähkömiehen käsikirja

(TTAE004) Analogue Electronics 1

Credits: 6 cr Timing: 1st yr

Learning Objectives: Students will be conversant with the basic electronic components and connections involved in analogue electronics, being able to apply the basic laws of electronics to small scale connections.

Contents: Passive components and filters
Types of diodes, diode response curves and basic connections
Calculating bipolar and field-effect transistor operating points and basic connections

Basic connections of operation amplifiers
An introduction to computer aided simulation methods (Micro-Cap)
The basic structure of CMOS logic circuits

Learning Methods: Lectures, exercises and demonstrations

Assessment Methods: Interim exams

Bibliography: Silvonen, K., Tiilikainen, M., Helenius, K., Analogiaelektroniikka
Volotinen, V., Analoginen elektroniikka, Komponentit ja peruskytkennät
Salo, P., Sähkötekniikan perusoppi 4, elektroniikka 1
Salo, P., Sähkötekniikan perusoppi 5, elektroniikka 2
Salo, P., Analogista elektroniikkaa, Periaatteita ja sovellutuksia

(TTAE005) Analogue Electronics 2

Credits: 4 cr Timing: 2nd yr

Learning Objectives: Students will know the functioning principles of basic electronics connections and will able to plan electronics appropriate for use in vehicles.

Prerequisite: Analogue Electronics 1

Contents: The functioning principles and most common components of basic connections, function-related solutions and features
Power source engineering
Thermal planning
The basics of electronics design
The basics of computer aided design

Learning Methods: Lectures and exercises

Assessment Methods: Interim tests and assignments

Bibliography: Lecture handouts
Silvonen, K., Tiilikainen, M., Helenius, K., Analogiaelektroniikka
Volotinen, V., Analoginen elektroniikka, Komponentit ja peruskytkennät
Salo, P., Sähkötekniikan perusoppi 4, elektroniikka 1
Salo, P., Sähkötekniikan perusoppi 5, elektroniikka 2
Salo, P., Analogista elektroniikkaa, Periaatteita ja sovellutuksia

(TTAD4Z) COMPUTER TECHNOLOGY 12 cr

Students will be competent in planning devices based on microprocessor technology.

(TTAD003) Digital Engineering

Credits: 6 cr Timing: 1st yr

Learning Objectives: Students will be proficient in the basics of digital engineering and components and will be proficient in designing and analysing digital connections.

Contents: Number systems
Boolean algebra

Digital electronics
Combinational logic
Basics of sequential logic
Sequential logic
Synchronous state machine

Learning Methods: Lectures and exercises

Assessment Methods: Interim tests

Bibliography: Rantala Pekka, Digitaalitekniikka
Piirikohtaiset manuaalit

(TTAD004) Microprocessor Engineering

Credits: 6 cr Timing: 2nd yr

Learning Objectives: Students will be proficient in the structural parts and functioning principles of a microprocessor system while being able to understand how a processor based device for use in vehicles works.

Prerequisite: Digital Engineering

Contents: Basic structure of a computer
Memory circuits
Selection of circuit
How microprocessors and the main I/O circuits work
Programming using Assembly or C language

Learning Methods: Lectures and exercises

Assessment Methods: Interim tests

Bibliography: Piiri- ja anturikohtaiset manuaalit
Rantala Pekka, Mikrotietokonetekniikka
Intel, MCS-51:n manuaalit

(TTAL0Z) TELECOMMUNICATIONS 14 cr

(TTAL003) Basics of Telecommunications Engineering

Credits: 6 cr Timing: 2nd yr

Learning Objectives: Students will gain a general overview of different telecommunications systems, how they work and their technical limitations

Contents: Concepts
Signal, noise; basics of information theory and encryption.
Structures of data communications systems
Basics of data transfer
Basics of wireless systems
Routes
Basics of information networks

Learning Methods: Lectures and written assignments

Assessment Methods: Exam

Bibliography: Lecture handout

(TTAL004) Basics of EMC

Credits: 3 cr Timing: 4th yr

Learning Objectives: Students will understand the basics of EMC and be able to protect vehicle devices against large fields of interference and transients.

Prerequisite: Telecommunications Engineering Telecommunications Laboratory Work

Contents: Basics of transmission lines and EM wave motion and progression. Basic structures of antennas.
E and M fields
Conducted and radiated interference and how to measure such interference
How interference becomes connected
Protection against interference

Learning Methods: Lectures and laboratory work

Assessment Methods: Exam. Approved laboratory assignments

Bibliography: Lecture handouts

(TTAL005) Basics of Signal Processing

Credits: 5 cr Timing: 3rd yr

Learning Objectives: Students will be conversant with signals and basic methods of signal processing while learning to use them in practice.

Contents: Describing signals
Complex numbers
Processing continuous time signals
Linear systems
Processing discrete time signals
Signal processing applications

Learning Methods: Lectures and exercises Introduction to signal processing software

Assessment Methods: Interim tests

Bibliography: Study handout

(TTAC0Z) PROFESSIONAL SUBJECTS, LABORATORY WORK 17 cr

(TTAC001) Laboratory Work, Basics

Credits: 3 cr Timing: 1st yr

Learning Objectives: Students will be conversant with the use of basic measurement devices and how to build simple electronic and digital connections.

Prerequisite: Electronics 1 and Digital Engineering Theory

Contents: Measurement device orientation and implemetation of basic measurements
Building and testing basic electronic connections
Combinational and sequential logic circuit connections
An introduction to circuit planning programmes (Micro-Cap)

Learning Methods: Laboratory work in small groups

Assessment Methods: Laboratory work, written reports and laboratory test (assessment 1 - 5)

Bibliography: Rantala Pekka, Digitaalitekniikka
Elektronics 1 - material
Component data pages
Measurement device manuals

(TTAC007) Analogue Electronics Laboratory Work

Credits: 5 cr Timing: 2nd and 3rd yr

Learning Objectives: Students will be able to carry out measurements on basic analogue electronic components and vehicle sensors, as well as building up connections and measuring their basic features using standard measurement equipment. Students will be proficient in planning, building, measuring and reporting on connection configurations consisting of several functions.

Prerequisite: Introduction to Laboratory Work Analogue Electronics 1

Contents: Planning, creating, measuring and written report of connections

Learning Methods: Small group teaching, included in RDI studies

Assessment Methods: Lab work, written reports and exam

Bibliography: Analogue electronics lecture handouts and literature

(TTAC008) Microprocessor Engineering Laboratory Work

Credits: 5 cr Timing: 2nd and 3rd yr

Learning Objectives: Students will learn to plan a processor based board and to use programming tools.

Prerequisite: Digital Technology, Introduction to Laboratory Work

Contents: Introduction to device oriented programming tools
Programming with Assembly and C-language
Introduction to vehicle sensors
The assignments include planning, constructing, programming and testing a processor based board.

Learning Methods: Small group teaching

Assessment Lab work, written reports and exam

Methods:

Bibliography: Piiri- ja anturikohtaiset manuaalit
Rantala Pekka, Mikrotietokonetekniikka
Intel, MCS-51:n manuaalit
(circuit and sensor manuals)

(TTAC009) Communications Laboratory Work

Credits: 2 cr Timing: 3rd yr

Learning Objectives: To deepen students' understanding of communications equipment and systems and short range communications devices.

Prerequisite: Communications Technology (during course)

Contents: Laboratory work
Different areas of communications engineering.

Learning Methods: Small group teaching through laboratory work

Assessment Methods: Approved lab reports

(TTAC010) Basics of Circuit Board Design

Credits: 2 cr Timing: 3rd yr

Learning Objectives: Students will know how to plan a circuit board using a circuit plan and will be able to apply their skills in creating their own product.

Contents: Circuit plans using a design programme and circuit boards made according to the plan.
Introduction to component library editing, creating a new component, elimination of interference, dimensioning different types of piece work and manufacturing proto-boards.

Learning Methods: Lectures, exercises, proto-board planning

Assessment Methods: Exam and practical proto-board assignment

OPTIONAL PROFESSIONAL STUDIES

Students will select one of the following modules. For further information on these modules please consult your study supervisor and lecturers.

(TTVA3Z) VEHICLE DATA SYSTEMS/SHARED COURSES 25 cr

(TTVA001) Basics of Measurement Technology

Credits: 3 cr Timing: 2nd yr

Learning Objectives: Students will be proficient in basic electronic measurements and the associated fault

and interference factors.

Contents: Measuring scales, measurement errors
SI system, measurement standards, calibration
General digital measurement device, oscilloscopes
Interferences associated with measuring
The most common sensors
Automation of measuring

Learning Methods: Lectures and exercises

Assessment Methods: Interim tests

Bibliography: Aumala, O., Mittaustekniikan perusteet
Lecture handout

(TTVA002) Information Networks and Buses

Credits: 2 cr Timing: 2th yr

Learning Objectives: Students will understand the topology, functioning principles and their limitations of different information carriers.

Prerequisite: Telecommunications

Contents: The most significant information networks and their frameworks. Ehternet. TCP/IP and its applications. The main vehicle information carriers.
CAN

Learning Methods: Lectures and exercises Small group teaching

Assessment Methods: Exam, approved assignments

Bibliography: Lecture handouts

(TTVA003) Introduction to Testing

Credits: 2 cr Timing: 2nd yr

Learning Objectives: Students will adopt the basic principles of testing embedded systems.

Contents: The aim of testing.
Testing products at different stages of their life-cycle

Learning Methods: Lectures and exercises

Assessment Methods: Exam and assignment

Bibliography: To be announced

(TTVA004) Embedded Systems Programming and Tools

Credits: 2 cr Timing: 2nd yr

Learning Objectives: Students will be able to programme processor-based embedded devices, use simulators and debuggers. They will also be able to produce code that generates documents automatically. They will be proficient in the use of the SVN version management tool as part of software development.

Contents: Programming tools, debuggers and simulators. Code documentation and version management

Learning Methods: Lectures and supervised exercises

Assessment Methods: Exam and learning diary based on exercises

Bibliography: To be announced

(TTVA005) Systems-on-Chip (SoC) Programming (VHDL)

Credits: 4 cr Timing: 4th yr

Learning Objectives: Students will adopt the principles of planning and creating a FPGA device

Contents: Planning methods and tools
ModelSim software for model creation using VHDL language and simulating and testing functions

Learning Methods: Lectures and supervised exercises

Assessment Methods: Exam, exercises and assignment

Bibliography: To be announced

(TTVA011) Product Development Laboratory Work/1

Credits: 3 cr Timing: 2nd yr

Learning Objectives: Students will know how to create an embedded device on a ready development platform.

Prerequisite: Introduction to Vehicle Information Systems Introduction to Product Development Project planning

Contents: Introduction to device-oriented programming tools
1:LabVIEW programming environment
2: Embedded systems development platforms

Learning Methods: Lectures and group teaching

Assessment Methods: Laboratory work, exercises and written reports

(TTVA009) Product Development Laboratory Work/2

Credits: 3 cr Timing: 3rd yr

Learning Objectives: Students will be able to transfer solutions from a development platform to their own product and further develop equipment. The aim is to plan and create a prototype.

Prerequisite: Product Development Laboratories/Laboratories 1 (own product project)

Contents: Creation of a embedded device prototype
Development of software for the device
Addition of device's electronics and if required, mechanical planning

Learning Methods: Small group teaching

Assessment Methods: Laboratories, exercises and written reports.

Bibliography: Circuit and sensor manuals
Lecture handouts

(TTVA012) Product Development Laboratory Work/3

Credits: 6 cr Timing: 4th yr

Learning Objectives: Students will prepare a product for production from their product prototype.

Prerequisite: Product Development Laboratories/Laboratories 2 (Own product project)

Contents: Development of an embedded device, its documentation and testing

Learning Methods: Small group teaching

Assessment Methods: Laboratories, written reports, seminar presentation

Bibliography: Circuit and sensor specific manuals and standards for this field

(TTVO0Z) VEHICLE DATA SYSTEMS/SOFTWARE ENGINEERING 16 cr

(TTVO001) Windows Programming

Credits: 3 cr Timing: 4th yr

Learning Objectives: Students will be proficient in the basics of Windows programming and hardware handling.

Prerequisite: Real-Time Operating Systems

Contents: Windows programming with Visual Studio
Using information networks
Hardware handling in Windows

Learning Methods: Lectures and supervised exercises

Assessment Methods: Exam, exercises and assignment

Bibliography: To be announced

(TTVO002) Realtime Operating Systems

Credits: 4 cr Timing: 4th yr

Learning Objectives: Students will be able to design, test and make real-time systems according to real-time standards using operating systems.

Contents: Real-time operating systems

Learning Methods: Lectures and supervised exercises

Assessment Methods: Exam, exercises and assignment

Bibliography: To be announced

(TTVO003) Telecommunications Programming

Credits: 3 cr Timing: 4th yr

Learning Objectives: Students will be proficient in designing and making basic telecommunications applications using vehicle busses.

Prerequisite: Embedded Device Programming and Tools

Contents: Protocol design and implementation

Learning Methods: Lectures and supervised exercises

Assessment Methods: Exam, exercises and assignment

Bibliography: To be announced

(TTVO004) Data Structures and Algorithms

Credits: 3 cr Timing: 4th yr

Learning Objectives: Students will understand the importance of using ready algorithms and be able to apply the most common algorithms.

Prerequisite: C++ Programming

Contents: Basics of applying ready algorithms
The most common algorithms:
Stacks, strings and linkaged lists
Tree structures
Significance of algorithm class of difficulty, assessment and measurement

Learning Methods: Lectures, supervised and independent exercises

Assessment Methods: Exam and assignment

Bibliography: To be announced

(TTVO005) Smart Systems

Credits: 3 cr Timing: 4th yr

Learning Objectives: Students will understand the functioning of systems based on artificial intelligence and the architecture used to create them.

Prerequisite: Data Structures and Algorithms

Contents: Introduction to artificial intelligence
Route finder agents and navigation
A system that learns

Learning Methods: Lectures and supervised exercises

Assessment Methods: Exam, exercises and assignment

Bibliography: To be announced

(TTVM0Z) VEHICLE DATA SYSTEMS/MEASUREMENT TECHNOLOGY DESIGN 16 cr

(TTVM001) Planning Testing and Fault Diagnosis

Credits: 2 cr Timing: 4rd yr

Learning Objectives: Students will be proficient in the main testing and fault diagnosis methods used for embedded systems and in applying these methods.

Contents: Testing plan
Fault diagnosis plan

Learning Methods: Lectures and exercises

Assessment Methods: Exam and assignment

Bibliography: To be announced

(TTVM002) Planning EMC and Environmental Testing

Credits: 2 cr Timing: 4th yr

Learning Objectives: Students will be proficient in the basic principles of EMC and environmental testing of embedded systems and able to compile the appropriate testing plans.

Contents: EMC testing and environmental testing methods.
EMC test plan and test implementation
Environmental test plan and test implementation

Learning Methods: Lectures and assignments

Assessment Methods: Exam and assignments

Bibliography: To be announced

(TTVM003) Microcontroller System Design

Credits: 4 cr Timing: 3rd yr

Learning Objectives: Students will be proficient in designing a vehicle microprocessor based system product

Prerequisite: Analogue Electronics 1 and 2 Digital Technology Microprocessor Technology

Contents:
Awareness of EMC requirements in all stages of device design
Planning of own electronics for own device
Multilayer printed board design
Thermal planning
Reliability technology
Using simulators and existing simulated models in design
Power feed planning

Learning Methods: Lectures and exercises, planning of electronics for own product project

Assessment Methods: Interim tests and assignments

Bibliography:
Lecture handouts
Study material from Analogue Electronics and Microprocessor Technology

(TTVM004) Sensor and Interface Electronics

Credits: 4 cr Timing: 3rd yr

Learning Objectives: Students will be conversant with the most common sensors and will learn to design the connection electronics required in their use.

Contents:
The basic features of sensors
Measuring mechanical quantities, temperature, pressure and humidity
Measuring flow speed
Measuring luminosity
Micro-sensors
Connecting electronics required in sensors

Learning Methods: Lectures and exercises

Assessment Methods: Interim tests

(TTVM005) LabVIEW Programming and Applications

Credits: 4 cr Timing: 4th yr

Learning Objectives: Students will know the basic structures of the LabVIEW programming language and will be able to use this language when creating measurement applications.

Contents:
Basic structures of the LabVIEW language
Applications in data logger boards, bus connected measurement devices and real-time systems
Applications in digital sensors

Learning Methods: Lectures and supervised exercises, group work

Assessment: Exercises and assignments

Methods:

Bibliography: LabVIEW Basics, Hands-On Course
Study handout

(VAPAAZ) FREE-CHOICE STUDIES 15 cr

Students can freely select 15 cr of studies that will support their professional development, from their own field/degree programme or from another degree programme in their own university of applied sciences, from another university of applied sciences or science university. Students will achieve wide-ranging expertise.

(TRW015) Build up Your English

Credits: 3 cr Timing: 1st yr

Learning Objectives: Students will develop and strengthen their language skills acquired during previous courses in order to be able to cope with their compulsory professional language studies. The aim is also to develop language learning skills.

Prerequisite: Proficiency test

Contents: Basic grammar and vocabulary
Activation of speaking and writing skills as well as reading and listening comprehension.

Learning Methods: Contact teaching

Assessment Methods: Active participation, exercises

Bibliography: Text book and/or handout

(TRW016) Bygg Upp Din Svenska

Credits: 3 cr Timing: To be announced

Learning Objectives: This course develops and strengthens Swedish skills acquired during earlier courses so that students will be able to cope with UAS level compulsory Swedish language studies in their own field of studies. The aim is also to develop language study skills.

Prerequisite: Proficiency test

Contents: Basic grammar and vocabulary.
Activating speaking and writing skills as well as listening and reading comprehension.

Learning Methods: Supervised exercises

Assessment Methods: Active participation 100 %, exam

Bibliography: Handout

(TYW076) Electric Car Technology

Credits: 4 cr Timing: 3rd and 4th yr

Learning Objectives: Students will be able to assess the social effects of the widespread use of electric cars while understanding how an electric or hybrid vehicle works. With the aid of competences provided during this and the Planning Embedded Systems course, they will be able to plan electronic units required in electric vehicles.

Prerequisite: Competence in electronics recommeded

Contents:
Use of electric cars and society
Principles of vehicle engineering
Batteries
Charging systems
Electric motors
Engine control systems
Braking energy retention

Learning Methods: Lectures Assignments Project work Included in RDI studies

Assessment Methods: Exams Assignments and project work

Bibliography: Lecture handouts

(TYW077) Electrical Power Engineering

Credits: 3 cr Timing: 3rd or 4th yr

Learning Objectives: Students will know the structure of the electricity transfer system and the basics of working safely with electricity, how the most common electrical devices work, the basics of power electronics, the most common forms of interference in the electricity network and how to eliminate them from devices.

Prerequisite: Physics of Electronics

Contents:
Power plant engineering
The structure of the electricity transfer system
Safe electrical work training course
Prices
Electric motors
Transformers
Reactive power and break in current
Components of power electronics
TRIAC power controllers
PFC technology

Learning Methods: Lectures and assignments Lab work Project assignment

Assessment Methods: Exams, lab work, assignments and project assignment

Bibliography: Lecture handouts

(TTWY020) Electronics Qualification Prep. Course

Credits: 3 cr Timing: 3rd or 4th yr

Learning Objectives: Students will be able to accomplish the Electricity Safety Certificate

Prerequisite: Physics of Electronics studies Electric Power Engineering or Power Current Engineering recommended

Contents: Electricity safety standard SFS6000
Working safely with electricity standard SFS6002
Electrical installation instructions
Safe repair of electric devices

Learning Methods: Lectures Assignments Mock exam National Electricity Safety Certificate

Assessment Methods: Attendance of lectures Mock exam

Bibliography: Certificate material from TUKES

(TYW073) Predictive Fault Diagnostics

Credits: 4 cr Timing: 2nd - 4th yr

Learning Objectives: Students will know the basic concepts and methods of predictive fault diagnostics being able to apply them to a simple electronic product.

Contents: Basic methods of fault diagnosis for electronic products at circuit, card and system level.

Learning Methods: Lectures, exercises and application to own product

Bibliography: As indicated by the teacher

(TYW074) Virtual Technologies

Credits: 5 cr Timing: 2nd - 4th yr

Learning Objectives: Students will know virtual technologies used to create virtual realities that feel real to those who experience them. Students will know the devices and systems used to produce 3D images and sound to create an artificial reality.

Contents: Devices and systems required in the creation of virtual realities (movement measurement systems, visualisation systems, 3D audio, wearable sensor systems), virtual reality modelling methods and applications

Learning Methods: Lectures and exercises

(TYW075) Machine Vision Applications

Credits: 3 cr Timing: 3rd - 4th yr

Learning Objectives: Students will know the devices used to create machine vision systems, how images are formed and digital image manipulation.

Contents: Cameras and lighting
Introduction to Vision Assistant and Vision Builder AI image manipulation software from a machine vision perspective

Learning Methods: Lectures, supervised exercises, group work

Assessment Methods: Lab work and their reports and written assignment

Bibliography: Assignment instructions and handouts

(TTWY019) The History of Engineering

Credits: 3 cr Timing: As wished

Learning Objectives: Students will understand the current situation of engineering in the light of historical development.

Contents: Main features of the engineering history from the antiquity to space time

Learning Methods: Lectures, essays, literature studies

Assessment Methods: Essays and studies

Bibliography: To be announced

(TTWY009) ANSI C -programming Language

Credits: 6 cr Timing: 3rd or 4th year

Learning Objectives: To provide students with a fundamental understanding of programming and software engineering so that they can program simple techical applications.

Contents: Introduction of C
Basic elements
Input and Output
Operators and expressions
Control statements
Functions
Pointers
Arrays
File Handling
Structures
Miscellaneous

Learning Methods: Internet/WebCT

Assessment Methods: Exam or exercises

Bibliography: To be announced

(TYW013) Abroad on Business

Credits: 1.5 cr Timing: Once/academic year.
To be announced.

Learning Objectives: Students will deepen their competences acquired from Intercultural Skills in ICT and Business English for ICT

Contents: Business trips abroad
Socializing and small talk
Talking about Finland
Travelling by air
Staying at a hotel
Eating out

Learning Methods: Contact lessons, pair and group work and presentation practice

Assessment Methods: Active participation; attendance minimum 80%; attendance will be controlled

Bibliography: Handout

(TTWY025) RFID Engineering

Credits: 4 cr Timing: 2nd - 4th yr

Learning Objectives: To provide students with basic knowledge of radio frequency ID technology

Contents: RFID tehcnology and environment
Identifiers and codes
Information transfer protocols and information security
Opportunities for using RFID technology

Learning Methods: Lectures and exercises

Bibliography: RFID guide, introduction to the technology

(TTWY002) Programming in Java

Credits: 6 cr Timing: 1st - 4th yr

Learning Objectives: The aim of this course is to provide basic programming skills in Java, in graphic programming and programming for mobile applications.

Prerequisite: Introduction to Data Processing Introduction to Programming

Contents: An introduction to programming
An introduction to programming graphics
An introduction to programming mobile applications

Learning Methods: A variety of learning strategies will be used including e-learning

Assessment Methods: To be announced

Bibliography: E-material

(TTOO0Z) THESIS 15 cr

(TTOO001) Thesis

Credits: 15 cr Timing: 4th yr

Learning Objectives: The aim of the thesis is to demonstate and develop the skills that students possess in applying their knowledge and know-how to professional studies and tasks requiring expertise in their chosen field. The topic of the thesis is usually agreed beforehand with the commissioning party and is based on the requirements of working life to support students' professional development. The thesis provides a wide-ranging demonstration of students' knowledge and know-how.

Contents: Selecting a subject from industry and commerce
Creating the necessary documents
Acceptance processes
Selecting the supervisor
Thesis
Presentation of thesis
Maturity test

Assessment Methods: Independent study, participation in supervision process

(TTHH0Z) PRACTICAL TRAINING 30 cr

(TTHH001) Practical Training

Credits: 30 cr Timing: 3rd yr/spring

Learning Objectives: The aim of the practical training period is to provide students with good post graduation employment opportunities and to familiarise students with working life. Students will gain knowledge of different job tasks, working procedures, devices and professional terminology related to their chosen specialism in a real working environment under supervision.

Prerequisite: Students must have 112 cr before starting their practical training period.

Contents: A usually continuous approx five month training period (800 working hours) in working life