

SCHOOL OF ENGINEERING / BACHELORS DEGREE IN ENGINEERING

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

Head of School: Jari Kähkönen

Study Secretary: Marita Karjalainen

Heads of Degree Programme:

Sanna Leinonen, Mechanical and Production Engineering Degree Programme

Jari Kurtelius, Construction Engineering Degree Programme

Risto Airaksinen, Information Technology Degree Programme

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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • knowledge of the requirements of profitable business operations • ability to carry out simple investment calculations
Mathematics and scientific competence	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • knowledge of the basic systems of machine automation, components and equipment • ability to plan and construct automated structures
Production competence	<ul style="list-style-type: none"> • 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
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GENERAL STUDIES	30 cr
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Mathematics	12 cr
Physics	12 cr
Industrial Chemistry	3 cr
Introduction to Data Processing	3 cr

LANGUAGE AND COMMUNICATION STUDIES	9 cr
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Finnish Language and Communication	3 cr
Text and Terminology	3 cr
Svenska för Maskin- och produktionsingenjörer	3 cr

BUSINESS ADMINISTRATION	12 cr
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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
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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 basic structure of a microcomputer and the use of Kajaanin UAS computers and their most common tools programmes and software for study purposes.

Contents: Computer hardware
The UAS data system
Use of networks
Directory structure
The basics of data processing
Spreadsheet calculation and graphics

Learning Methods:	Small group work and exercises
Assessment Methods:	Exam and assignments
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
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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 (4., uudistettu painos)
Handout

(TKPK005) Text and Terminology 1

Credits:	1.5 cr	Timing:	1st yr
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Learning Objectives: Machine and production engineering students will be able to read their own professional literature and write technical documents.

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

Contents: Technical language as a tool
The special grammatical features of technical language
Vocabulary building
Developing reading techniques
Documentation

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

Assessment Methods: Active participation, assignments; written exam

Bibliography: Handout

(TKPK006) Text and Terminology 2

Credits: 1.5 cr Timing: 2nd yr

Learning Objectives: Machine and production engineering students will be able to read their own professional literature, write technical documents, search for and process information.

Contents: The special grammatical features of technical language
Vocabulary building
Developing reading techniques
Documentation
Oral and written reporting and summarising.

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

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

Bibliography: Texts processed by students

(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 official 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, spoken and written exam

Bibliography: Handouts

(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: 3rd 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 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

(TKAE002) Intercultural and Business Skills 1

Credits: 1.5 cr Timing: 2nd yr

Learning Objectives: This course develops machine and production engineering students' intercultural competence so that they are able to recognise cultural differences, understand them and adjust their communication as required by the situation.

Contents: Concepts of culture and communication
 Variables used to compare cultures
 Cultural differences in communication The process of adapting to another culture

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

Assessment Methods: Active participation, project and its oral presentation

Bibliography: Handout

(TKAE003) Intercultural and Business Skills 2

Credits: 1.5 cr Timing: 3rd yr

Learning Objectives: Mechanical and production engineering students will apply their intercultural communication competence and develop their ability to work in international and multicultural working contexts using English for spoken and written interaction.

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

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

Assessment Methods: Active participation, spoken and written assignments

Bibliography: 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 participation

Bibliography: Hasari, H., Salonen P., Teknillinen piirtäminen
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

Moulding techniques
 Sheet and coupling techniques
 Machine cutting
 Coating methods

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., NC -tekniikan perusteet

(TKAC014) The Basics of Computer Aided NC Programming

Credits: 3 cr Timing: 3rd 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 Methods: Exam (50%, assessment 1 - 5) and assignments and attendance (50%, assessment 1 - 5)

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

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 encountered 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 sets, appropriate documentation and presentation.

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 Lectures and assignments
 Methods:

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 2 interim exams
 Methods:

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 course-work

Assessment
 Methods: 2 interim exams

Bibliography: Kärkkäinen, Mikkonen, Insinöörin mekaniikka
 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 course-work

Assessment
 Methods: Final exam

Bibliography: Blom, S., Lahtinen, P., Nuutio, E., Pekkola, K., Pyy, S., Rautiainen, H., Sampo, A., Seppänen, P., Suosara, E., Koneenelimet ja mekanismit
 Further reading/material provided by lecturer

(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 mechanical 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.

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

(TKAJ003) Data Systems

Credits: 3 cr Timing: 3rd 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 Exam and assignments
Methods:

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 automation 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 exam, assignments
Methods:

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

Contents:

- Principles of sensors
- Connecting position transducers
- 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, course-work, laboratory work

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

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, handouts Airila, Mekatroniikka, Otatiето, 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: 3rd 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 - 4rd 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: Accomplishment of all set tasks and documentation.

Methods:

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

OPTIONAL PROFESSIONAL STUDIES cr

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 minimum 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 Exam
Methods:

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) Mechanical 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: Completion of project assignment and reporting

Methods:

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., NC-tekniikan perusteet

(TKVN002) Computer-Aided NC Programmimg

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 Completion of the assignment and its documentation and presentation

Methods:

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 performance 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.

Contents: Modelling robots and the work environment
Use of basic models
Programming
Simulating the system
Connecting to the production system

Learning Methods: Lectures and assignments

Assessment Methods: Assignments

Bibliography: Material will be provided by the lecturer

(TKVV003) ProEngineer/Inventor

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: Computer Aided Design, Basic Course

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 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: Maintenance 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

Assessment Methods:	Exam and assignment
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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
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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
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Bibliography: Karrus, K., Logistiikka
Material as advised by the lecturer

(TKVJ004) Commodification and Production

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.

Previous Learning: Introduction to Chemistry

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

(TKVA003) Particle Technology

Credits: 3 cr Timing: 3rd yr

Learning Objectives: Students will gain knowledge of the principles of mineral technology, the properties of granular material, the unit processes of particle technology and the equipment used in these processes.

Previous Learning: Introduction to Geology

Contents: Crushing, grinding and classification
Making crushing and grinding circuits
Crushing and grinding equipment

Learning Methods: Lectures, assignments

Assessment Methods: Exam, assignments and laboratory work

Bibliography: Material as indicated by the teacher

(TKVA004) Benefication Technology

Credits: 3 cr Timing: 3rd yr

Learning Objectives: Students will be proficient in the basic methods of benefication and the structures of benefication equipment. They will also gain knowledge of pumps and pumping, the

transfer of solids-fluid suspensions, and of the separation of solids from water/gas mixtures.

Previous Learning: Particle Technology

Contents: Flotation
Specific gravity and magnetic separation
Fluid mechanics and transfer of fluids
Separation of solids
Pumping and filtering
Equipment maintenance

Learning Methods: Lectures, calculation exercises and laboratory work

Assessment Methods: Exam, assignments and laboratory work

Bibliography: Material as indicated by the teacher

(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

(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 tasks of an expert 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 a suitable topic from the business world
Completion of necessary documentation
Acceptance process
Choosing a supervisor
Completion of thesis
Presentation of thesis

Maturity test

Assessment Methods: The progress and evaluation form must be returned to the supervisor.

(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. Mr Eero Soininen is the practical training co-ordinator 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 usually continuous approx five month training period (800 working hours) in working life

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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Management system control • Quality management • Occupational safety and well-being management • Organizational leadership • Work contract competence • Competence in interpersonal relationships
Specialist competence in renovation	<ul style="list-style-type: none"> • Renovation building process and technology management

	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	53 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	11 cr
Introduction to Business Economics	3 cr
Leadership and Interpersonal Skills	5 cr
Marketing Project	3 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	109 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	10 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 CONSTRUCTION ENGINEERING

BASIC STUDIES

(TRPV0Z) LANGUAGE AND COMMUNICATION SKILLS 12 cr

(TRPV001) Communication Skills in Finnish

Credits: 3 cr Timing: 1st yr

Learning Objectives: Students will practice 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)

Learning Methods: Independent work, group work, lectures

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

Bibliography: Kauppinen, A., Nummi, J., Savola, T., Tekniikan viestintä (4., uudistettu painos)
Handout

(TRPV007) Text and Terminology 1

Credits: 1.5 cr Timing: 1st yr

Learning Objectives: Construction engineering students will be able to read their own professional literature and write technical documents.

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

Contents: Technical language as a tool
The special grammatical features of technical language
Vocabulary building
Developing reading techniques
Documentation

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

Assessment Methods: Active participation, assignments; written exam

Bibliography: Handout

(TRPV008) Text and Terminology 2

Credits: 1.5 cr Timing: 2nd yr

Learning Objectives: Construction engineering students will be able to read their own professional

literature, write technical documents, search for and process information.

Contents: The special grammatical features of technical language
Vocabulary building
Developing reading techniques
Documentation
Oral and written reporting and summarising.

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

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

Bibliography: Texts processed by students

(TRPV005) Swedish for Construction Engineers

Credits: 3 cr Timing: 2nd yr

Learning Objectives: Students will develop their oral and writing skills in Finland's second official language specifically to aid their own professional development.

Contents: Construction engineering terminology, vocabulary and communication situations

Learning Methods: Supervised exercises

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

Bibliography: Handout

(TRPV006) Introduction to Data Processing

Credits: 3 cr Timing: 1st yr

Learning Objectives: Students will be conversant with the basics of data processing and data security, and know how to use the university's computers and peripheral equipment, and the most common tools programmes in their studies.

Contents: Introduction to data processing
Microcomputer equipment and peripheral devices
Windows XP
Internet and email
Word processing with MS Word
Spreadsheet calculation with MS Excel
Presentation graphics with MS PowerPoint

Learning Methods: Contact and online teaching

Assessment Methods: Exam and assignments

Bibliography: Reading list/material provided by lecturer

(TRPB2Z) BUSINESS STUDIES 11 cr

The contents of this module are the same for all the schools at Kajaani UAS.

(TRPB001) Introduction to Business Economics

Credits: 3 cr Timing: 1st yr

Learning Objectives: Students will be conversant with basic business functions and have a general overview of business planning.

Contents: Basic concepts of business
Internal and external entrepreneurship
Business processes and operational environment
Business financing
Monitoring business profitability
Profit margin and investment calculation
Business planning

Learning Methods: Lectures and exercises

Assessment Methods: Exam and written business plan

Bibliography: Handout

(TRPB002) Leadership and Interpersonal Skills

Credits: 5 cr Timing: 4th yr

Learning Objectives: Students will understand the importance of leadership in terms of achieving targets within an organisation. This course also covers typical forms of team/group work within the students' own school and solving customer service problems.

Contents: Work psychology
Human resource management
Professional ethics
Occupational health and safety
Challenging customer service situations from a psychological point of view
Group and team work within construction engineering and facilities management
An introduction to meeting and negotiating skills

Learning Methods: Lectures, exercises, group work

Assessment Methods: Participation in group work and study visits, exercises and exam

Bibliography: Kauppinen A., Nummi J., Savola T., Hänninen M., Tekniikan viestintä
Handouts

(TRPB004) Marketing Project Work

Credits: 3 cr Timing: 2nd yr

Learning Objectives: Students will understand customer needs as being the driving force of business and will be able to commodify such needs to create business.

Contents: Selecting a target group
Segmentation

Clarifying customer needs
 Setting targets
 Competition methods in marketing
 Marketing strategy
 Feedback system
 Developing operations

Learning Methods: Lectures, assignment

Assessment Methods: Assignment, exam

Bibliography: Handout

STUDIES IN MATHEMATICS AND SCIENCE 30 cr

This module serves as an introduction to mathematics and science for engineering.

(TRPM2Z) MATHEMATICS 15 cr

This module serves as an introduction to mathematics and science for engineering.

(TRPM004) Algebra and Geometry

Credits: 6 cr Timing: 1st yr

Learning Objectives: This course partially reviews and supplements the basics of high school and vocational college mathematics, encouraging a disciplined and determined approach to learning and the development of interaction skills

Contents: Number series 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 1

(TRPM005) Differential and Integral Calculus

Credits: 6 cr Timing: 1st yr

Learning Objectives: Students will be able to use integral and differential calculus to examine simple functions and to calculate surface areas, volume and work quantities.

Contents: Review of basic algebra calculation skills
 Derivate and function growth rate
 Examination of a function graph

Extreme values
 Undetermined 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

(TRPM006) Probability and Statistics

Credits: 3 cr Timing: 2nd yr

Learning Objectives: Students will know the basic concepts of probability calculation and basic 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

(TRPF3Z) PHYSICS 12 cr

Students will gain basic knowledge of Physics and be introduced to different measurement techniques.

(TRPF001) Physics 1

Credits: 4 cr Timing: 1st year

Learning Objectives: This course aims to provide background knowledge required in other modules of the degree programme.

Contents: Physics system of units and quantities
 Mechanics

Learning Methods: Lectures and exercises

Assessment
 Methods: Exam

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

(TRPF002) Physics 2

Credits: 5 cr Timing: 1st yr

Learning Objectives: This course aims to provide the physical background knowledge required in other modules of the degree programme.

Contents: Thermodynamics, Electricity
Wave motion and acoustics,

Learning Methods: Lectures and exercises

Assessment Methods: Interim exams

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

(TRPF003) Physics, Laboratory Work

Credits: 3 cr **Timing:** 2nd yr

Learning Objectives: Students will gain concrete knowledge of physics through experimentation. This course also provides an introduction to measurement techniques and written reporting.

Contents: Practical applications of physics topics presented during previous physics courses in this module.

Learning Methods: Laboratory exercises

Assessment Methods: Completion of all laboratory assignments and written reports (assessment grades 1 - 5)

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

(TRPK4Z) CHEMISTRY 3 cr

(TRPK001) An Introduction to Chemistry

Credits: 3 cr **Timing:** 1st - 2nd yr

Learning Objectives: To provide an overview of high school chemistry and to increase students' knowledge of environmental chemistry. This course also covers the chemical properties of construction materials and how they age and corrode.

Contents: The periodic table, mol and reactions
Concentration and PH. Chemical balance
The chemical properties of cement
Corrosive features of concrete and steel

Learning Methods: Lectures and exercises

Assessment Methods: Exams

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

COMPULSORY PROFESSIONAL STUDIES AND PROJECT WORK 109 cr

Students will be conversant with the central issues and knowledge concerning facilities management and will also know how and where to find further information on the subject.

(TRAK0Z) ENGLISH LANGUAGE AND COMMUNICATION STUDIES 3 cr

(TRAK002) Intercultural and Business Skills 1

Credits: 1.5 cr Timing: 3rd yr

Learning Objectives: Construction engineering students will have the intercultural competence to recognise and understand cultural differences, while being able to use a communication style appropriate to the situation.

Contents: Concepts of culture and communication
Variables used to compare cultures
Cultural differences in communication
The process of adapting to another culture

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

Assessment Methods: Active participation, project and its oral introduction

Bibliography: Handout

(TRAK003) Intercultural and Business Skills 2

Credits: 1.5 cr Timing: 3rd yr

Learning Objectives: Construction engineering students will be able to apply their intercultural competence and develop their ability to function using spoken and written English in multicultural interactive situations in working life.

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

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

Assessment Methods: Active participation, oral assignments

Bibliography: Handout

(TRAL2Z) HOUSING TECHNOLOGY 8 cr

Students will gain knowledge of the significance and limitations of facility

automation and device technology from the facility financial upkeep point of view.

(TRAL005) Automation Systems

Credits: 4 cr Timing: 2nd yr

Learning Objectives: Students will gain a general overview of the general structure of an automation system, cabling and data transfer.

Contents: Sensor technology
Prgrammable logic systems
Digital instrumentation systems
Pneumatic instrumentation systems
Remote drive systems

Learning Methods: Lectures and exercises

Assessment Methods: Exam

Bibliography: To be announced

(TRAL006) Housing Engineering

Credits: 4 cr Timing: 3rd yr

Learning Objectives: Students will gain knowledge of the technical equipment and systems of buildings and how they work

Contents: Heating, plumbing and ventilation systems
Automated systems

Learning Methods: Lectures and assignments

Assessment Methods: Exams

Bibliography: To be announced

(TRAO5Z) BUSINESS ECONOMICS AND LAW 6 cr

(TRAO003) Environmental Law

Credits: 3 cr Timing: 4th yr

Learning Objectives: Students will be conversant with Finnish environmental law, the license and permits system and legislation concerning land use and construction through practical examples. Students will be introduced to different planning procedures and their significance in terms of property end use.

Contents: Environmental protection legislation
Assessment of environmental consequences law
Nature conservation laws
Land use and construction laws
Land use and construction statutes
Planning system: provintial planning, general and town planning

Learning Methods: Lectures and course-work

Assessment Methods: Assignments, summary and exam

Bibliography: Hollo E.J., Ympäristönsuojelu- ja luonnonsuojeluoikeus. Talentum 2004
Maankäyttö- ja rakennuslaki perusteluineen. Edita lakikokoelma 1999.
Handout

(TRAO004) Contract Law and Legislation in a Housing Company

Credits: 3 cr Timing: 4th yr

Learning Objectives: Students will know the common principles and regulations of contract law and the central aspects of housing company law.

Contents: The judicial system
Making contracts and representation
Work contracts, annual holidays and working time
Room leasing
Housing company structure: administration, housing company charge regulations, maintenance responsibility

Learning Methods: Lectures and online studies

Assessment Methods: Online assignments

Bibliography: To be announced

(TRAH4Z) BUILDING DESIGN AND CONSTRUCTION 16 cr

(TRAH001) Building Materials

Credits: 3 cr Timing: 1st yr

Learning Objectives: Students will gain knowledge of the properties, manufacturing technology and use of building materials and implements.

Contents: The most common building framework and building parts materials
The mechanical, thermal and moisture properties of building materials
The manufacture of building materials

Learning Methods: Lectures - small group and independent

Assessment Methods: Exam and assignments

Bibliography: Handouts during lectures
Siikanen, U., Rakennusaineoppi
Construction engineering register (applicable parts)

(TRAH002) Construction Physics

Credits: 5 cr Timing: 2nd yr

Learning Objectives: Students will gain basic knowledge of the technical behaviour of thermal, moisture and air currents in building constructions. They will also have the necessary know-how to carry out thermal and moisture planning for buildings.

Contents: Building regulations
The principles of planning in structural physics
The transfer and movement of heat and moisture in building structures
Convection physics in building structures
ADP applications
Laboratory exercises

Learning Methods: Lectures, exercises and laboratory work

Assessment Methods: Exam and assignments

Bibliography: Building regulations
Björkholtz, D., Lämpö ja kosteus. Rakennusfysiikka
Ympäristöministeriö, Ympäristöoppaat 28, 29 ja 51

(TRAH003) Building Frames

Credits: 4 cr **Timing:** 1st yr

Learning Objectives: This course covers building construction parts, load-bearing frame and supplementary building parts, their functional properties and building procedures as well as the requirements of fire technical and acoustic planning.

Previous Learning: Building Materials

Contents: Building frame parts sorted according to building parts
Different frameworks and their functions
Loads on the building frame
Fire safety and sound insulation of buildings
The construction principles of wood, concrete and steel framed buildings
Population shelters (emergency shelters)

Learning Methods: lectures, exercises and building site visits

Assessment Methods: Exam and assignments

Bibliography: Handouts
Building regulations and construction engineering register - applicable parts

(TRAH004) Construction Drawing

Credits: 4 cr **Timing:** 1st yr

Learning Objectives: Students will be able to utilise AutoCAD and create construction and structural drawings using application programmes.

Contents: Creating drawings using AutoCAD 2008/2010 and ARK 11. The course assignment is to create drawings of a detached family house for building permission purposes.

Learning Methods: Lectures and exercises

Assessment Sufficient attendance and approved assignment

Methods:

Bibliography: Lecture handout
Illikainen, K., AutoCAD

(TRAR6Z) CONSTRUCTION ECONOMICS 10 cr

(TRAR001) Building and Construction

Credits: 4 cr Timing: 2nd yr

Learning Objectives: Students will understand the basic principles of project implementation, planning and management. They will be able to manage the main tasks, duties and procedures of contract building and they will be conversant with different types of contract work and contracts.

Contents: Project work
The different stages of contract building
Managing the project from beginning to end from the developer's point of view
Different types of contract work
Contractual Dealing

Learning Methods: Lectures, course-work and group work

Assessment Methods: Exam and assignments

Bibliography: Handouts Kankainen, J., Junnonen, J., Rakennuttaminen
Liuksiala, A., Rakennussopimukset

(TRAR002) Cost and Quality Management

Credits: 3 cr Timing: 2nd yr

Learning Objectives: This course provides in depth knowledge of building project financial management and monitoring, as well as property quality engineering taking into account property life cycles.

Previous Learning: Knowledge of the Building and Construction Trade

Contents: The principles of project financial management
Cost planning, quantity calculation and monitoring costs
Property life cycle client and production quality

Learning Methods: Lectures, assignments

Assessment Methods: Exam and exercises

Bibliography: Nissinen Sampsa., Koskenvesa Anssi. Pientalon kustannukset. Rakennustieto Oy.
ISBN 951-682-763-2.
Handouts

(TRAR004) Building and Construction Economics, Project

Credits: 3 cr Timing: 2nd yr

Learning Objectives: Students will know how to carry out a quantity survey for a construction project that takes into account construction quality and life-cycle costs. Students will be able to select building materials based on ecological and economic principles.

Previous Learning: Cost and Quality Control on the Construction Site.

Contents: Quantity survey for a real building project.

Learning Methods: Supervised cost control project

Assessment Methods: Approved project work

Bibliography: Building project planned by students. Other literature to be announced.

(TRAT3Z) PRODUCTION TECHNOLOGY 12 cr

(TRAT003) Construction Machinery and Equipment

Credits: 3 cr **Timing:** 1st yr

Learning Objectives: Students will become familiar with the most usual construction machines and equipment. They will be able to use them safely and effectively and to anticipate dangerous situations. They will also learn to be aware of the checks and official regulations for such machines and devices. They will also gain an overview of the effect of the construction machine/type of device on economic, high quality and safe construction work.

Previous Learning: None

Contents: Most significant construction machinery and equipment, their use and maintenance.
Safety issues and inspections
The effect of machinery on cost effectiveness and quality.
The regulations and inspections linked to the procurement of machinery and equipment,
Management responsibility in the use of machinery and equipment.

Learning Methods: Lectures, group work, case evaluation and analysis

Assessment Methods: Exam. Assignments

Bibliography: To be announced

(TRAT009) Occupational Safety in Construction and Facility Management

Credits: 3 cr **Timing:** 2nd yr

Learning Objectives: Students will understand the significance of occupational safety in facility management and building production. The course provides proficiency in building site safety inspections, safety notices and official regulations. Students will be aware of the responsibilities and importance of the site manager in building site safety promotion.

Previous Learning: none

Contents: Occupational safety in facilities management and during different construction phases.
Building site inspections and notices.
Official regulations and work requiring official authorisation.
The duties and responsibilities of the employer in terms of work safety.
How to act in an emergency
First Aid I course

Learning Methods: Lectures, group work and exercises

Assessment Methods: Exam and approved accomplishment of First Aid I

Bibliography: Hietavirta Jukka, Niskanen Toivo, Patrikainen Harri, Päiväranta Keijo, Rakennustöiden turvallisuusmääräykset selityksineen. Multiprint Oy. Helsinki 2009.

(TRAT005) Building Site Management and Inspection Work

Credits: 3 cr Timing: 3rd yr

Learning Objectives: Students will learn to differentiate between the duties of the site superintendant (manager) and site inspector in a construction project. They will gain an overview of the opportunities for cooperation and responsibilities of different interest groups and of the importance of leadership, communication and interaction skills in such projects.

Contents: The site superintendant's (manager's) cooperation with the developer or client, the inspector, contractors, and planners.
The special features of leading a building project
The duties of the site manager/superintendant
Building site inspection, meetings, guidelines from the authorities and documentation

Learning Methods: Lectures and assignments

Assessment Methods: Active participation and exam

Bibliography: To be announced

(TRAT006) Introduction to Project Management

Credits: 3 cr Timing: 2nd yr

Learning Objectives: Students will learn to understand different types of project opportunities and the special features associated with project work on building sites. Students will be able to recognise the significance of communication and scheduling to achieve cost-effective construction targets.

Contents: The principles and opportunities of projects in construction work.
Use of project management IT programme for construction projects.
Scheduling and resource planning.
How management and leadership affects projects

Learning Methods: Lectures and assignments

Assessment Methods: Exam and completed assignments

Bibliography: To be announced

(TRAE6Z) STRUCTURAL TECHNOLOGY 19 cr

This module covers the functioning principles of load-bearing structures.

(TRAE001) Statics

Credits: 3 cr Timing: 1st yr

Learning Objectives: Students will understand the static functioning of single building parts and they will be able to estimate the effects of loads on vertical and horizontal structures that are supported in different ways.

Previous Learning: Physics 1, Mathematics 1-2

Contents: Mass point planar statics
Stiff piece planar statics
Stress and stress patterns.

Learning Methods: Lectures and course-work

Assessment Methods: Exam

Bibliography: Outinen, H., Statiikka tekniikan opiskelijoita varten, osat I ja II
Handouts

(TRAE002) Strength of Materials

Credits: 3 cr Timing: 1st yr

Learning Objectives: Students will comprehend the effects of different stress and cross-sectional shape on structural tension and changes in structure shape.

Previous Learning: Statics

Contents: The link between stress and changes in shape
Tension, compression, cutting
Bending stress of a straight beam
The concepts of buckling, lateral torsional instability, buckling of plate

Learning Methods: Lectures and course-work

Assessment Methods: Exam

Bibliography: Hietikko, E., Palkki, Lujuuslaskennan perusteet, Otava, Keuruu 2004

(TRAE003) Steel and Wooden Structures

Credits: 4 cr Timing: 2nd yr

Learning Objectives: This course introduces students to the properties of the most common steel and wooden structures as well as their design, dimensioning and manufacture.

Previous Learning: Statics Strength of Materials

Contents: Usual steel and wooden products and their uses
Official regulations
Design of beam and column structures
Wooden and steel joints and splices

Learning Methods: Lectures and calculation exercises

Assessment Methods: Exam and assignments

Bibliography: RIL 201-1999, Rakenteiden kuormat, Euronormi
Eurocode 1: Suunnitteluperusteet ja rakenteiden kuormat.
Eurocode 3: Teräsrakenteiden mitoitus
Eurocode 5: Puurakenteiden mitoitus

(TRAE007) Concrete Structures

Credits: 3 cr **Timing:** 2nd yr

Learning Objectives: Students will know the basic features of steel concrete structures and will be proficient in the dimensioning of the most common steel concrete structures.

Previous Learning: Statics, Strength of Materials

Contents: Introduction to planning and dimensioning steel concrete structures
Dimensioning steel concrete post and tile structures
Dimensioning steel concrete column and wall structures

Learning Methods: Lectures and calculation exercises

Assessment Methods: Exam and assignments

Bibliography: Eurocode 0: Rakenteiden suunnittelun perusteet.
Eurocode 1: Rakenteiden kuormitukset.
Eurocode 2: Betonirakenteiden suunnittelu.

(TRAE006) Concrete Structures, Laboratory Work

Credits: 3 cr **Timing:** 2nd yr

Learning Objectives: Students will gain a sound knowledge of concrete engineering, concrete work and the manufacture of concrete structures, the ingredients of concrete, freshly mixed concrete and hardened concrete and the factors affecting the properties of concrete. Students will learn concrete proportioning, how to choose the correct ingredients to make the desired concrete mix, how to mix concrete and test freshly mixed concrete and also trial use of concrete.

Contents: The course consists of laboratory exercises, calculation drills and lectures. The laboratory exercises consist of practical exercises and lab reports. Dry aggregate tests, casting and related quality control tests and test piece trials will be carried out in the laboratory. Additionally the functioning of a reinforced steel concrete structure will be studied by test loading a beam.

Learning Methods: Lectures and laboratory exercises

Assessment Methods: Exam and compulsory laboratory assignments

Bibliography: Handouts
BY 201, Betonitekniiikan oppikirja 2004

(TRAE005) Foundations

Credits: 3 cr Timing: 2nd yr

Learning Objectives: Students will have basic knowledge of the birth of Finnish soil, the features of the soil layers and how foundations are laid for different buildings and yards, preventing ground frost damage and drying.

Contents: Soil types and their geotechnical properties
Ground surveying
Laying foundations for buildings and yards
Foundation damage and repairing old foundations
Radon protection
Ground frost prevention
Drying out the foundation area
Reinforcing foundation area of the construction site
Clearing, protecting and excavating the construction area

Learning Methods: Lectures and assignments

Assessment Methods: Exam and assignments

Bibliography: RIL 121-2004 Pohjarakennusohjeet
RIL 126-2009 Rakennuspohjan ja tonttialueen kuivatus
Raimo Jääskeläinen, Pohjarakennuksen perusteet
VTT, Rakennustieto OY, Talonrakennuksen routasuojausohjeet
Raimo Jääskeläinen, Geotekniikan perusteet

(TRAM9Z) RENOVATION TECHNOLOGY 24 cr

(TRAM009) Mould and Damp Damages

Credits: 3 cr Timing: 1st yr

Learning Objectives: This course provides students with an overview of microbiological damage in buildings, how it is caused and methods of repair.

Contents: Properties of microbes, microbe species and where they can be found.
Problems with dampness, mould and decay in buildings.
The effects of heat and damp on the birth of damage caused by moisture and mould
Mould and damp microbes and health
Researching and reporting damage caused by damp and mould
Prevention of microbe damage in the construction planning and building stages

Learning Methods: Lectures, examination of real examples, av teaching and group assignments

Assessment Methods: Exam, approved assignments

Bibliography: Study handout

(TRAM002) Renovation Technology, Basics

Credits: 3 cr Timing: 2nd yr

Learning Objectives: The course provides basic information on facility condition and maintenance in terms of the structure, building part or features of the building for the purposes of future renovation.

Contents: Concepts and general significance to the national economy
Recent style and material history
Healthy building and problem materials
Typical material damage and damage mechanisms
Typical structural damage and damage mechanisms
Possibilities of renovation

Learning Methods: Lectures, av teaching and group work

Assessment Methods: Exam and approved assignments

Bibliography: Kerrostalot 1880-2000
Kerrostalot 1880-1940
Kerrostalot 1940-1960
Kerrostalot 1960-1975
Asbesti asuinkerrostaloissa
Lecture handouts
RT-kortisto

(TRAM004) Condition Surveys and Inspections

Credits: 3 cr Timing: 2nd yr

Learning Objectives: Students will be able to survey structural defects in property themselves, using available surveying devices and procedures. They will also be able to compile a residential property condition estimate and carry out condition surveys on concrete elevations.

Contents: Condition estimate of residential property
Basic survey of a property's energy economy
Housing market condition survey
Condition survey of a concrete elevation

Learning Methods: Supervisory lectures and exercises for project work

Assessment Methods: Exam

Bibliography: KH-kortisto soveltuvien osien
BY 42, Betonijulkisivun kuntotutkimus 2002

(TRAM007) Condition Surveying Project Work

Credits: 6 cr Timing: 3rd yr

Assessment Methods: Approved Technical Renovation Building Plan

OPTIONAL PROFESSIONAL STUDIES 12 cr

Students must select one 12 cr study module from optional professional studies in addition to 6 cr of optional project work.

(TRVI0Z) FACILITY MANAGEMENT 12 cr

Students will understand the significance of the management of information produced by the facility's devices in managing the facility. Students will also learn about housing and real estate company staff and financial administration.

(TRVI005) Construction Automation

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

Learning Objectives: Students will be proficient in automation applications for house technology.

Previous Learning: Automation Systems, House Technology

Contents: Measuring heat, air currents and pressure, adjustment and reporting
Consumption measurements
Burglar, fire and HVACE alarms and their controls

Learning Methods: Lectures and assignments

Assessment
Methods: Exams

Bibliography: To be announced

(TRVI006) Information Systems in Maintenance

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

Learning Objectives: Students will understand the importance of acquiring data from devices installed in a property.

Previous Learning: Automation Systems, House Technology

Contents: Consumption data registers
Machine files
Connection agreements
The connection between data systems and automatic devices in properties

Learning Methods: Lectures and assignments

Assessment
Methods: Exams

Bibliography: To be announced

(TRVI003) Accounting in a Housing Company

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

Learning Objectives: Students will know the principles and methods of bookkeeping and internal and external accounting requirements of a housing company.

Contents: Double entry bookkeeping

Budget
Routine bookkeeping
Financial statement and cost accounting
Taxation

Learning Methods: Lectures and online studies

Assessment
Methods: Online assignments

Bibliography: To be announced

(TRVI004) Economy and Administration in Real Estate Communities

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

Learning Objectives: Students will know the funding and security issues of real estate communities, long-term financial planning, personnel administration and contractual procedures and liability issues.

Contents: Obligation of debtor to creditor
Securities
Financial planning
Personnel administration
Liability and compensation

Learning Methods: Lectures/online studies

Assessment
Methods: Online studies

Bibliography: To be announced

(TRVT1Z) PRODUCTION TECHNOLOGY 12 cr

Students will gain in depth knowledge of production technology and control methods.

(TRVT001) Production Planning and Control

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

Learning Objectives: Students will gain an overview of building scheme implementation production planning and supervision methods.

Contents: Work timing and supervision
Schedules (types and levels)
Combining schedules, work and contract work periods
Work phasing and cycles
Schedule monitoring and control
Production information sources

Learning Methods: lectures and exercises

Assessment
Methods: exam

Bibliography: To be announced

(TRVT002) Procurement and Logistics of a Building Site

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

Learning Objectives: Students will be conversant with the principles of procurement and logistics for the purposes of managing materials and information flow.

Contents: The significance and procedures of procurement
The principles of procurement and acquisition planning
The central conditions and aims of supply/delivery and contract work contracts
Complaints
Building site logistics planning

Learning Methods: Lectures and assignments

Assessment Methods: Exam

Bibliography: To be announced

(TRVT003) Site Technology

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

Learning Objectives: Students will deepen their knowledge of site technology and different construction methods so that they can compare them and select the appropriate method to achieve specific goals.

Contents: The different stages of building work and site planning.
The effects of phasing construction work on the schedules, costs and other parts of the construction project.
Different/alternative building methods
The preparation and implementation of different phases of construction

Learning Methods: Lectures and exercises, possible site visit

Assessment Methods: Exam and assignments

Bibliography: Betonitekniiikan oppikirja by 201
Lecture handouts
RT kortisto

(TRVT004) Measurement Technology

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

Learning Objectives: Students will learn how to carry out different types of procedures related to construction measuring and the sizing of work. They will gain an appreciation of the effects of measurement technology on construction quality and work quantity surveying on the costs of the project.

Contents: Horizontal and vertical coordinate systems
Measurement devices

Use of construction site measurement devices
 Measuring buildings, building parts and structures
 Band and surface effects in the field
 Permitted tolerances, module networks and join measurements

Learning Methods: Lectures, assignments and field measurement exercises

Assessment Methods: Exam and successfully completed assignments

Bibliography: To be announced

(TRVP0Z) TIMBER CONSTRUCTION 12 cr

Students will deepen their knowledge of timber engineering and construction and their practical working life skills.

(TRVP005) Wood as a Raw Material

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

Learning Objectives: Students will know the properties of wood, wood products and the basics of planning construction with wood.

Previous Learning: Building Materials

Contents: Use of wood in building
 The technical properties of wood
 The classification and sorting of wood
 The physical properties of wood
 Preventing wood decay
 Wood products

Learning Methods: Lectures and assignments

Assessment Methods: Exam and assignments

Bibliography: To be announced

(TRVP006) Wood Product Marketing and Internationalization

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

Learning Objectives: Students will know the economic significance of marketing in the domestic and international markets and the importance of their own activities in marketing a company.

Contents: Marketing planning
 Marketing procedures
 Marketing laws and regulations
 Export trade risk analysis
 International networking

Learning Methods: Lectures and assignments

Assessment Methods: Exam and assignments

Bibliography: To be announced

(TRVP007) Wood Construction Regulations

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

Learning Objectives: Students will understand the laws, regulations and instructions concerning energy-efficient construction and be able to apply them in their work.

Contents: Fireproofing and sound insulation of wood
Energy efficiency in wood construction
Internal air in low energy construction
Quality control

Learning Methods: Lectures and assignments

Assessment Methods: Exam and assignments

Bibliography: To be announced

(TRVP008) Wood Construction Site Technology

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

Learning Objectives: Students will be able to perceive an overall construction based on planning documents and can apply this skill in their work.

Previous Learning: Frame Structures

Contents: Timber house structures and construction
Timber elements
Building with whole timbers
Timber joins and facades

Learning Methods: Lectures and assignments Study visits to prefabricated house factories

Assessment Methods: Exam and assignments

Bibliography: To be announced

(TRVV0Z) AN OPTIONAL PROJECT 6 cr

Students will gain in depth practical knowledge of facilities management.

(TRVV001) An Optional Project

Credits: 6 cr Timing: 3rd - 4th yr

Learning Objectives: Students will gain in depth working knowledge of facilities management and construction technology.

Contents: Students will focus on a real problem of a real target within their own optional

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.

Previous Learning: Before the Practical Training period students should have achieved 112 cr.

Contents: An uninterrupted five-month training period (about 800 working hours)in working life.

DEGREE PROGRAMME IN INFORMATION TECHNOLOGY

Measurement and 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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)	<ul style="list-style-type: none"> • will understand client-oriented product development • will be conversant with the different stages of product development and will understand the

	<p>significance of project planning and documentation</p> <ul style="list-style-type: none"> • 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
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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

Knowledge 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 **63 cr**

COMMUNICATION SKILLS **14 cr**

Finnish Language and Communication 1	3 cr
Finnish Language and Communication 2	2 cr
Text and Terminology 1	1.5 cr
Text and Terminology 2	1,5 cr
Svenska för Fordonsingenjörer	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 **76 cr**

English Language and Communication Skills	5 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
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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

(TTPV1Z) LANGUAGE AND COMMUNICATION SKILLS 14 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 (4., 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 (4., uudistettu painos)
Nykänen, O., Toimivaa tekstiä. Opas tekniikasta kirjoittaville.

(TTPV010) Text and Terminology 1

Credits: 1.5 cr Timing: 1st yr

Learning Objectives: Information technology students will be able to read their own professional literature and write technical documents.

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

Contents:	Technical language as a tool The special grammatical features of technical language Vocabulary building Developing reading techniques Documentation
Learning Methods:	Contact teaching, assignments, independent, pair and group work.
Assessment Methods:	Active participation, assignments; written exam
Bibliography:	Handout

(TTPV011) Text and Terminology 2

Credits:	1.5 cr	Timing:	2nd yr
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Learning Objectives: Information technology students will be able to read their own professional literature, write technical documents, search for and process information.

Contents:	The special grammatical features of technical language Vocabulary building Developing reading techniques Documentation Oral and written reporting and summarising.
Learning Methods:	Contact teaching, independent, pair and group work.
Assessment Methods:	Active participation, searching for and processing technical texts, oral presentations
Bibliography:	Texts processed by students

(TTPV013) Svenska för fordonsingenjörer

Credits:	3 cr	Timing:	3rd yr
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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, oral and written exam
Bibliography:	Study handout

(TTPV007) Data Processing, Basics

Credits:	3 cr	Timing:	1st yr
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Learning Objectives: Students will be conversant with basic information processing 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 data processing
Computer hardware and peripheral devices
Windows
Internet and email
Word processing with MS Word
Spreadsheet accounting with MS Excel
Presentation graphics with PowerPoint

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 assignments

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
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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:	3rd yr
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Learning Objectives: Students will be aware of the general tenets and effects of contract and intellectual property rights and legislation in product development.

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

Learning Methods: Lectures and assignments

Assessment Methods: Exam and portfolio

Bibliography: To be announced

(TTPK005) Project Leadership

Credits:	3 cr	Timing:	4th yr
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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

(TTPM004) Algebra and Geometry

Credits: 6 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: Character strings and calculations
Functions
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., Algebra II
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

(TTPF004) Physics 1

Credits: 7 cr **Timing:** 1st yr

Learning Objectives: Students will gain the necessary physics skills and knowledge required in engineering.

Contents: Physics quantity and unit system
Motion and the theory of dynamics

Work, power and energy
Momentum
Circular and rotating motion
Fluids and gases
Thermology

Learning Methods: Lectures and exercises

Assessment Methods: Interim tests

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

(TTPF005) Physics 2

Credits: 5 cr Timing: 2nd yr

Learning Objectives: Students will gain the skills and knowledge in Physics required in the other engineering courses.

Contents: Electrostatics
Magnetic field
Electromagnetic induction
Vibrations, mechanical wave motion
Electrical vibrations
Optics, photometry
Quantum physics

Learning Methods: Lectures and exercises

Assessment Methods: Interim tests

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 assignments 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

Learning Objectives: Information technology students will be able to apply and reinforce their intercultural communication competence in order to function within spoken and written interaction situations within a multicultural and international working life

context.

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

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

Assessment Methods: Active participation, spoken and written assignments

Bibliography: Handout

(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

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

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 transport leads 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 connections

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

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 Methods: Lab work, written reports and exam

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: 2nd 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 cr

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: 4th 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. Ethernet. 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: 3rd 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 and 3rd 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: 3rd and 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

(TTVA006) Product Development Laboratory Work/1

Credits: 4 cr Timing: 2nd and 3rd yr

Learning Objectives: Students will be able to build an embedded device on a prepared developer 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 system developer platforms.

Learning Methods: Lectures and small group teaching

Assessment Methods: Lab work, assignments and written reports

Bibliography: Circuit and sensor manuals
Lecture handouts

(TTVA007) Product Development Laboratory Work/2

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

Learning Objectives: Students will be able to transfer solutions developed using the developer platform to their own products and further develop the equipment. Students will plan and create prototypes of their own products

Prerequisite: Product Development Laboratories (Own product project)

Contents: Creation of prototype of embedded device
Development of device software, electronics and mechanical parts if required

Learning Methods: Small group teaching

Assessment Methods: Laboratory work, exercises and written reports

Bibliography: Circuit and sensor manuals
Lecture handouts

(TTVA008) Product Development Laboratory Work/3

Credits: 4 cr Timing: 4th yr

Learning Objectives: Students will put the finishing touches to production versions of their products created from the prototypes.

Prerequisite: Product Development Laboratory Work/ Lab Work 2 (Own product project)

Contents: Embedded system product development, documentation and testing

Learning Methods: Small group teaching

Assessment Methods: Lab work, written reports. Seminar presentation

Bibliography: Circuit and sensor manuals.
Standards

(TTVO0Z) VEHICLE DATA SYSTEMS/SOFTWARE ENGINEERING 16 cr

(TTVO001) Windows Programming

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

Learning Objectives: Students will be able to plan dynamic and static data structures required in vehicles and understand the functioning principles of the algorithms needed to process such structures. They will be able to carry out simple processing routines and to assess how much memory the structures will need and to analyse the performance of the algorithm.

Prerequisite: C language

Contents:	Introduction Stacks, strings and linkaged lists Trees and networks Search and sort methods
Learning Methods:	Lectures, supervised and independent exercises
Assessment Methods:	Exam and assignment
Bibliography:	To be announced

(TTVO005) Smart Systems

Credits:	3 cr	Timing:	3rd and 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
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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 Methods: Exercises and assignments

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

(TTWY002) Programming in Java

Credits:	6 cr	Timing:	1.- 4. 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		

(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 recommended		
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		

(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