Filters used for the printout

Curriculum period: 2024-2025. Studies included in the printout: Courses. Languages of the descriptions: English. Language of the printout template: English.

LUTDEXCHAUTUMN Exchange Studies (Autumn Semestern)

LUTDEXCHAUTUMN Exchange Studies (Autumn Semester)

CURRICULUM PERIOD 2024-2025

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	min 20 cr
Languages	English
Grading scale	Grading scale for degrees (distinction)
Content approval required	no
Locations	Lappeenranta
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	Lappeenranta-Lahti University of Technology LUT 100%
Responsible persons	Minna Loikkanen, Responsible teacher Tarja Pettinen, Responsible teacher Jonna Naukkarinen, Responsible teacher Armi Rissanen, Responsible teacher Annukka Ilves, Administrative person
Degree programme type	Master's Degree
Degree titles	Master of Science (Technology)
Study field	Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs)
Education classification	751203 Master of Science (Technology), Engineering Physics

Content description

EN: Whether you are planning to stay for a semester or a year, the exhange students coming to LUT have a proud history of enjoying themselves.
LUT will offer a large number of courses in many academic fields and the choice is yours! However, in order for you to make the most of your stay, please be proactive and take responsibility for your study plan and your studies.

Most of the courses are intended for Master's level or final year Bachelor students, but there are also choices available for those in their Bachelor studies. As the majority of courses are taught at the Master's level, students are expected to have bachelor level knowledge of relevant subjects.

The courses you include in your learning agreement may be subject to chance. A learning agreement is not considered as a course registration.
When starting your studies at LUT you need to enroll to courses and exams.

It is possible to study approximately 30 ECTS credits per one semester. Minimum number of credits per semester is 20.

We at Lappeenranta-Lahti University of Technology LUT (LUT University) invite you to join our high-standard and cross-cultural education and research community.

More information about exhange study experience at LUT www.lut.fi/exhange

Additional information

EN: Please note that courses Power Exchange Game for Electricity Markets (BL20A0201) and Electrical Drives (BL30A1001) are taught during periods 3-4 so can only be chosen in case the student is studying both autumn and spring periods.

DEGREE STRUCTURE

Part of the degree	Credits
EXCHANGE STUDIES (AUTUMN SEMESTERN) DRAFT	min 20 cr
MASTER'S LEVEL STUDIES (grouping module)	
KEDEXCHAUTUMN CHEMICAL ENGINEERING DRAFT	min 0 cr
BJ02A0060 Laboratory Safety Course DRAFT	1 cr
BJ02A1012 Concepts of Analytical and Inorganic Chemistry * THERE IS NO VERSION OF THE STUDY IN THE SELECTED CURRICULUM PERIOD	5 cr
BJ02A1032 Solution and Electrochemistry DRAFT	2-5 cr
BJ04A5010 Advanced Biorefineries DRAFT	5 cr
BJ04A7010 Bioeconomy DRAFT	5 cr
BJ02A2011 Modelling of Unit Operations DRAFT	5 cr
BJ02A2041 Advanced Process Design DRAFT	5 cr
BJ02A2080 Project on Product and Process Design DRAFT	10 cr
BJ02A2090 Process Simulation and Monitoring Applications DRAFT	5 cr
BJ02A3010 Membrane Technology DRAFT	5 cr
BJ02A3030 Solid-Liquid Separation * THERE IS NO VERSION OF THE STUDY IN THE SELECTED CURRICULUM PERIOD	5 cr
BJ02A3051 Hydrometallurgy DRAFT	5 cr
BJ02A3061 Circular Economy for Materials Processing DRAFT	5 cr
BJ02A4070 Principles of Thermal Gas-Liquid Processes DRAFT	5 cr
BJ03A1011 Introduction to Water Treatment Technologies DRAFT	5 cr
BJ03A1020 Biological Waste Water Treatment DRAFT	5 cr
BJ03A1040 Advanced Materials in Adsorption and Ion Exchange DRAFT	5 cr
BJ03A2040 Research Project Course in Water Treatment DRAFT	10 cr
BJ02A0011 Laboratory Work Course in Chemical Technology DRAFT	10 cr

BJ02A0012 Advanced Laboratory Course in Chemical Technology 30 cr
DRAFT

BJ02A0050 Orientation to M.Sc. Studies 1 cr
DRAFT

BJ02A6020 Power-to-X processes 5 cr
DRAFT

LADEXCHAUTUMN COMPUTATIONAL ENGINEERING min 0 cr
DRAFT

BM30A0550 Photonics 6 cr
DRAFT

BM40A0702 Pattern Recognition and Machine Learning 6 cr
DRAFT

BM40A1201 Digital Imaging and Image Preprocessing 6 cr
DRAFT

BM20A7401 Inverse Problems 5 cr
DRAFT

BM20A7601 Numerical Methods for Partial Differential Equations 5 cr
DRAFT

BM20A8501 Probabilistic Simulation 5 cr
DRAFT

BM20A6100 Advanced Data Analysis and Machine Learning 6 cr
DRAFT

BM20A7200 Bayesian Continuous-Parameter Estimation 5 cr
DRAFT

BM20A9001 Numerical Simulation 5 cr
DRAFT

BM20A7300 Functional Analysis 5 cr
DRAFT

SADEXCHAUTUMN ELECTRICAL ENGINEERING min 0 cr
DRAFT

BL20A1300 Energy Resources 6 cr
DRAFT

BL20A0601 Electrical Power Transmission 5 cr
DRAFT

BL30A1440 Electric and Hybrid Vehicle Powertrains 4 cr
DRAFT

ENDEXCHAUTUMN ENERGY TECHNOLOGY min 0 cr
DRAFT

BH10A1900 Fundamentals of Energy Technology 2 cr
DRAFT

BH40A0802 Fluid Machinery 4 cr
DRAFT

BH40A1560 Fundamentals of Computational Fluid Dynamics 6 cr
DRAFT

BH50A1200 Energy Systems Engineering 6 cr
DRAFT

BH50A1300 Maintenance Management 4 cr
DRAFT

BH50A1400 Steam Boilers 6 cr
DRAFT

BH61A0600 Bioenergy 3 cr
DRAFT

BH70A0200 Advanced Topics in Modelling of Energy Systems 6 cr
DRAFT

BH50A0301 Power Plant Design 6 cr
DRAFT

YMDEXCHAUTUMN ENVIRONMENTAL TECHNOLOGY min 0 cr
DRAFT

BH60A0252 Solid Waste Management Technology 7 cr
DRAFT

BH60A0451 Air Pollution Control 6 cr
DRAFT

BH60A4402 Sustainability in Socio-Technological context 6 cr
DRAFT

BH60A6300 Energy Efficient Environment 1 3 cr
DRAFT

BH60L3000 Biological Cycle in Circular Economy 6 cr
DRAFT

BH60L4000 Technical Cycle in Circular Economy 6 cr
DRAFT

TUDEXCHAUTUMN INDUSTRIAL ENGINEERING AND MANAGEMENT min 0 cr
DRAFT

CS10A0864 Research Methods in Management 6 cr
DRAFT

CS30A1342 Technology and Innovation Management: project course 6 cr
DRAFT

CS34A0551 Business Idea Development 6 cr
DRAFT

CS30A1620 Artificial Inventiveness 1 cr
DRAFT

CS30A0010 Technology and innovation management: introductory course 3 cr
DRAFT

CT80A0000 Data-Intensive Systems 6 cr
DRAFT

CS30A1372 Creative Design and Problem Solving 6 cr
DRAFT

CS39A0220 Accessibility design and management for people with disabilities 3 cr
DRAFT

CS30A0810 Must-Have Math for Decision Makers 3 cr
DRAFT

CS30A0820 The Dark Side of Sustainability 3 cr
DRAFT

KODEXCHAUTUMN MECHANICAL ENGINEERING min 0 cr
DRAFT

BK10A3800 Principles of Industrial Manufacturing Processes 5 cr
DRAFT

BK10A3900 Reliability Based Machine Element Design 5 cr
DRAFT

BK60A1700 Control and Design of Robot Systems 5 cr
DRAFT

BK70A0001 Simulation of a Mechatronic Machine 5 cr
DRAFT

BK80A3000 Integrated Design and Fabrication of Welded Structures 5 cr
DRAFT

BK70A0600 Computational Methods in Mechanics 5 cr
DRAFT

BK50A5400 3D-Forming and Converting of Materials 5 cr
DRAFT

BK70A0800 Computer Aided Engineering 5 cr
DRAFT

BK80A1402 Fatigue Design 5 cr
DRAFT

BK20A3200 Welding Quality and Economy 5 cr
DRAFT

BK70A0900 Hardware and Software of Automated Vehicles 5 cr
DRAFT

BK30A1700 Advanced Additive Manufacturing and 3D Printing 5 cr
DRAFT

TIDEXCHAUTUMN SOFTWARE ENGINEERING min 0 cr
DRAFT

CT60A5103 Software Engineering Models and Modeling 6 cr
DRAFT

CT60A5500 Quality Assurance in Software Development 6 cr
DRAFT

CT70A5000 Impact and Benefits of Digitalization 6 cr
DRAFT

CT10A2400 Digitalization and Sustainability 6 cr
DRAFT

CT10A7004 Sustainability and IT 6 cr
DRAFT

CT10A7022 Personal Literature Study 6 cr
DRAFT

CT70A7000 Digital Business Platforms 6 cr
DRAFT

CT80A0200 Software Business 6 cr
DRAFT

KIEEXCHAUTUMN LANGUAGE STUDIES min 0 cr
DRAFT

FINNISH (grouping module)

K200CE69 Finnish 1 3 cr
DRAFT

K200CE70 Finnish 2 3 cr
DRAFT

K200CH62 Finnish 3 3 cr
DRAFT

K200CH63 Finnish 4 3 cr
DRAFT

K200CL50 Finnish for Work 1 5 cr
DRAFT

K200CP86 Finnish for Work 3 5 cr
DRAFT

KM00CO04 Finnish Culture and Society 3 cr
DRAFT

K200CU41 Suomi with Love 1 3 cr
DRAFT

ENGLISH (grouping module)

- KE00BZ84 English for Professional Development (Business) 4 cr
  DRAFT
- KE00BZ85 English for Professional Development (Technology) 4 cr
  DRAFT
- KE00BZ83 English for Professional Development (ESTIEM) 4 cr
  DRAFT
- KE00CG81 Business Writing 3 cr
  DRAFT
- KE00BZ81 Academic Writing 3 cr
  DRAFT
- KE00CG33 Writing for Digital Media 4 cr
  DRAFT
- KE00CQ38 Introduction to Copywriting 2 cr
  DRAFT
- KE00CG79 Professional Reading 3 cr
  DRAFT
- KE00CQ81 Effective Presentations 2 cr
  DRAFT
- KE00BZ82 Professional Meetings and Discussions 4 cr
  DRAFT
- KE00BX35 English Pronunciation 1 cr
  DRAFT
- KE00CC64 English Prep Course 3 cr
  DRAFT

GERMAN (grouping module)

- KD00CH39 German 1 3 cr
  DRAFT
- KD00CH40 German 2 3 cr
  DRAFT
- KD00CH41 German 3 3 cr
  DRAFT
- KD00CH42 German for Work 1 3 cr
  DRAFT
- KD00CT54 German for Work 3 3 cr
  DRAFT
- KD00BX51 Business German 3 cr
  DRAFT
- KD00CZ29 Speaking Skills in German 3 cr
  DRAFT

FRENCH (grouping module)

- KF00CH30 French 1 3 cr
  DRAFT
- KF00CH31 French 2 3 cr
  DRAFT
- KF00CH32 French 3 3 cr
  DRAFT
- KF00CG43 French for Work 1 3 cr
  DRAFT
- KF00CG44 French for Work 2 3 cr
  DRAFT

SPANISH (grouping module)

- **KP00CK94** Spanish 1 — 3 cr
  DRAFT
- **KP00CH26** Spanish 2 — 3 cr
  DRAFT
- **KP00CH27** Spanish 3 — 3 cr
  DRAFT
- **KP00BX61** Spanish for Working Life 1 — 3 cr
  DRAFT
- **KP00BX62** Spanish for Working Life 2 — 3 cr
  DRAFT

CHINESE (grouping module)

- **KC00CQ66** Basic Chinese 1 — 5 cr
  DRAFT
- **KC00CQ68** Intermediate Chinese 1 — 3 cr
  DRAFT

INTERCULTURAL COMPETENCE AND COMMUNICATION (grouping module)

- **KM00BX75** Each one teach one — 3 cr
  DRAFT
- **KE00CH94** Diversity Management and Global Citizenship — 5 cr
  DRAFT
- **KE00CF69** Intercultural Competence and Communication — 5 cr
  DRAFT

BACHELOR'S LEVEL STUDIES (grouping module)

KAKEXCHAUTUMN BUSINESS ADMINISTRATION — min 0 cr
DRAFT

- **A380A0320** Applied Consumer Behaviour — 6 cr
  DRAFT
- **A130A0620** Basics in MS Excel for Business Students — 3 cr
  DRAFT
- **A380A0131** Business Relationships in International Value Networks — 6 cr
  DRAFT
- **A240A0010** Introduction to Programmatic Business Analytics — 6 cr
  DRAFT
- **A320A0011** Introduction to International Entrepreneurship — 6 cr
  DRAFT
- **A380A7001** Introduction to International Business — 6 cr
  DRAFT
- **KAKEXCHLITOAUTUMN** BUSINESS ADMINISTRATION ONLY FOR ENGINEERING STUDENTS — min 0 cr
  DRAFT
  - **VA10A1500** Introduction to Entrepreneurship — 5 cr
    DRAFT
  - **VA10A1700** Understanding and Managing a Business as a Dynamic Whole - Business Simulation Game — 5 cr
    DRAFT
- **A130A0670** Mathematics for Economics — 6 cr
  DRAFT
- **A250A0620** Fundamentals of Accounting and Finance — 6 cr
  DRAFT
- **A380A7010** Principles of Management and Leadership — 6 cr
  DRAFT

A380A0270 Introduction to International Marketing and Purchasing 6 cr
DRAFT

LAKEXCHAUTUMN COMPUTATIONAL ENGINEERING * min 0 cr
THERE IS NO VERSION OF THE STUDY IN THE SELECTED CURRICULUM PERIOD

BM20A7102 Statistics II 4 cr
DRAFT

BM20A8901 Primer to Numerical Programming 4 cr
DRAFT

SAKEXCHAUTUMN ELECTRICAL ENGINEERING min 0 cr
DRAFT

BL10A0102 Basics of Electrical Engineering 2 cr
DRAFT

BL20A0710 Introduction to Electrical Power Systems 5 cr
DRAFT

BL30A0510 Introduction to Electrical Drives 3 cr
DRAFT

BL40A3010 Introduction to Electrochemical Energy Storage and Conversion Technologies 4 cr
DRAFT

ENKEXCHAUTUMN ENERGY TECHNOLOGY min 0 cr
DRAFT

BH20A0720 Engineering Thermodynamics 6 cr
DRAFT

BH10A1900 Fundamentals of Energy Technology 2 cr
DRAFT

YMKEXCHAUTUMN ENVIRONMENTAL TECHNOLOGY min 0 cr
DRAFT

BH60A7200 Circular.now 3 cr
DRAFT

BH60A6801 Sustainable.now 3-5 cr
DRAFT

BH60A5401 Introduction to Circular Economy 5 cr
DRAFT

TUKEXCHAUTUMN INDUSTRIAL ENGINEERING AND MANAGEMENT * min 0 cr
THERE IS NO VERSION OF THE STUDY IN THE SELECTED CURRICULUM PERIOD
DRAFT

LESKEXCHAUTUMN LUT SCHOOL OF ENERGY SYSTEMS min 0 cr
DRAFT

LES10A020 Engineering Physics 3 cr
DRAFT

LES10A200 Engineering Mathematics I 3 cr
DRAFT

LES10A210 Engineering Mathematics II 3 cr
DRAFT

LES10A290 Overview of China 4 cr
DRAFT

LES10A410 Engineering Project Work 5-10 cr
DRAFT

LES10A420 Overview of China 3 cr
DRAFT

KOKEXCHAUTUMN MECHANICAL ENGINEERING — min 0 cr
DRAFT

- **BK10A6202** Mechatronics — 5 cr
  DRAFT
- **BK10A7300** Machine Elements and Principles — 5 cr
  DRAFT

TIKEXCHAUTUMN SOFTWARE ENGINEERING — min 0 cr
DRAFT

- **CT30A3232** Basics of Linux — 3 cr
  DRAFT
- **CT60A5540** Computer networks and Internet — 3 cr
  DRAFT
- **CT70A9110** Software Development Skills: Front-End — 3 cr
  DRAFT
- **CT70A9140** Software Development Skills: Full-Stack — 3 cr
  DRAFT
- **CT70A9120** Software Development Skills: Mobile — 3 cr
  DRAFT
- **CT30A2910** Introduction to Web Programming — 3 cr
  DRAFT

***** Not included because it does not correspond to the selected responsible organisations or curriculum period

FILTERED COURSES

BJ02A0060 Laboratory Safety Course

BJ02A0060 Laboratory Safety Course

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	1 cr
Languages	English
Grading scale	Pass-Fail
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Chemical Engineering 100%
Responsible persons	Armi Rissanen, Administrative person Liisa Puro, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta, Lahti, Mikkeli, Kouvola

Prerequisites

EN: Course is only for students attending any master program (biorefineries, chemical engineering for energy transition, food processing technology, water technology, SBBE) which include laboratories during the same study year.

Learning outcomes

EN: After the course the student - Recognizes the risk in laboratory work and can take into account them when working in laboratory - Understands the meaning of safety in laboratory work and how to put it into practice - Understands the whole chemical chain and is able to
handle chemicals safely - Can choose the proper protection to work in the laboratory - Knows what to do in emergency or exceptional situation - Understands the roles, tasks and responsibilities of different persons, learns to work in group.

Content

EN: In the course it is told how to work safely in laboratory and which risks you should notice. In addition the chemical handling chain is explained and material safety data sheets are read. Different personal protection equipment are shown and how to choose them. The action in emergency and exceptional situations are handled as well as the roles and responsibilities of personnel in organization are discussed.

Additional information

EN: 100% attendance required.

Study materials

EN: Slides, videos, material safety data sheets.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	1 cr
Course Completion		1 cr

BJ02A1032 Solution and Electrochemistry

BJ02A1032 Solution and Electrochemistry

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	2-5 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Chemical Engineering 100%
Responsible persons	Armi Rissanen, Administrative person Ekaterina Laakso, Responsible teacher Eveliina Repo, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Full digi -course

Prerequisites

EN: BJ01A3010 Kemiallinen termodynamiikka (Chemical Thermodynamics) or equivalent studies.

Equivalences to other studies

BJ80A0500 Surface and Colloid Chemistry

Learning outcomes

EN: Upon completion of the module, the student has a deeper understanding on solution and electrochemistry and the student is capable to
-evaluate the thermodynamic properties of electrolyte and nonelectrolyte solutions in the modern way.
- define central parts of electrochemical cells and electrochemical equipment
- define concepts and calculate electric potential, electric field, cell potential, null potential, electrochemical potential, and activity
- calculate Tafel slopes and reaction orders for multiple-step electrochemical reactions
- calculate liquid-junction and membrane potentials in simple cases
- analyze a given electrochemical cell or experiment
- describe the structure of the electrified interface
- give an overview of applications of electrochemistry.

Content

EN: Course will be divided in two parts:
Part I: Solution Chemistry (2 cr): Ideal, ideally dilute, and real solutions. The Debye-Hückel theory for electrolyte solutions. Pitzer equations for real electrolyte solutions. Equilibrium in electrolyte solutions. (1. period)

Part II: Fundamentals of Electrochemistry (3 cr): Conductivity and capacitance. Electrolysis cells and galvanic cells. Potential differences across Liquid junctions. Basics of electrochemical analysis. Electrochemical energy storage: Batteries and fuel cells. Electrodes and electrode reactions. Electrode kinetics: Current-voltage characteristics of charge-transfer reactions. Reaction order. Two laboratory works included (can be conducted remotely with help of videos) (2. period)

Student can conduct only Part I or both parts.

Additional information

EN: First time in the academic year 2020-2021. Suitable for distance learning. Suitable for doctoral studies.

Note! Students in Water Technology programme must take this course as 5 credits!

Study materials

EN: Lecture notes and calculation exercises with solutions based for example on the following textbooks: Peter Atkins, Julio de Paula, and James Keeler. Atkins' Physical Chemistry, 11th Edition, 2017, Oxford University Press.Kenneth Pitzer (edited), Activity Coefficients in Electrolyte Solutions, 2nd Edition, 2000, CRC Press, Boca Raton.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	5 cr
Course Completion		5 cr
Method 2	Recurrence 1: 1. period-2. period	2 cr
Participation in teaching		2 cr

BJ04A5010 Advanced Biorefineries

BJ04A5010 Advanced Biorefineries

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	5 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT

Responsible organisation	LENS, Chemical Engineering 100%
Responsible persons	Armi Rissanen, Administrative person Kristian Melin, Responsible teacher
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: kokonaan verkossa / full digi

Prerequisites

EN: B.Sc. studies. The course does not have any pre-requisites, but basic knowledge of organic chemistry will be of help.

Equivalences to other studies

BJ02A4041 Processing of Biomaterials

Learning outcomes

EN: By the end of the course, the student is expected to be able to
- Understand the basic concept of a biorefinery and most common biorefinery concepts for production of fibre and material products, fuel and chemical products from biomass

- Understand which raw material can be used to produce which products

- understand how biorefineries can be connected to industry such as energy production and oil refineries

- Knows the main biorefining processes, e.g. kraft pulping process, production of biofuels, chemicals, material products such as hemicelluloses, lignin and carbon products, biofuel and chemicals

- Is able to apply the knowledge and skills to evaluate feasibility of different biorefinery processes and their main challenges

- Have general knowledge of current biorefinery products, their value chain and applicability to different end-uses

Is able to apply management and cooperation skills in implementation of project work

Content

EN: The course covers the most typical biorefining processes production of fibers, material products hemicelluloses, lignin and carbon products, biofuel 1 st and 2nd generation and chemicals
- The globally most common bio-based raw materials for biorefineries

-Connection of Biorefineries to other industrial processes such as energy production and oil refineries

- Most common biorefinery products and their value chain

Additional information

EN: This course is mainly directed to the students of the MSc in Biorefineries.
***

the course is related to the The course is related to UN's Sustainable Development Goals (SDG): 7 affortable and clean energy, 9 industry, innovation and infrastucture, 11 sustainable cities and communities and 13 climate action.

Study materials

EN: In Moodle

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period, Summer	5 cr
Course Completion		5 cr
Method 2	Recurrence 1: 1. period-2. period, Summer	5 cr
Course Completion		5 cr

BJ04A7010 Bioeconomy

BJ04A7010 Bioeconomy

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	5 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Chemical Engineering 100%
Responsible persons	Armi Rissanen, Administrative person Ikenna Anugwom, Responsible teacher Mikko Rahtola, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: kokonaan verkossa / full digi

Learning outcomes

EN: By the end of the course, the student is expected to
- gain the basic understanding of various perspectives of bioeconomy
- gain updated knowledge of modern biorefineries and the basic prerequisites for operation and sustainable business.

Content

EN: The study entities are: The multidimensional impact of bioeconomy on Europe, the implementation of bioeconomy, the sustainability – all three dimensions - aspects of bioeconomy. The course is carried as assignments based on selected topics from the book and additional material. Course is planned for distance learning.

Study materials

EN: Book: A Sustainable Bioeconomy The green industrial revolution by Professors Mika Sillanpää and Chaker Ncibi. Other related material announced later.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period, Summer, Summer	5 cr
Course Completion		5 cr

BJ02A2011 Modelling of Unit Operations

BJ02A2011 Modelling of Unit Operations

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	5 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Chemical Engineering 100%
Responsible persons	Armi Rissanen, Administrative person Tuomas Sihvonen, Responsible teacher Arto Laari, Responsible teacher Esko Lahdenperä, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta

Prerequisites

EN: Either the Finnish course Johdatus tekniseen laskentaan or Principles of Technical Computing, or corresponding skills in MATLAB programming.

Learning outcomes

EN: After completing the module, the student is able to describe steady-state and transient unit operations with mathematical models, to verify and validate models and to estimate their parameters from experimental data, to apply models in process development and design, including sizing, optimization, and scale-up, and to use mathematical and simulation software.

Content

EN: Modeling and parameter estimation of Chemical Engineering unit operations using MATLAB . The course presents some of the most common unit operations of Chemical Engineering, including batch reactors, continuous stirred tank reactors (CSTR's), both in dynamic and steady state; tubular plug flow reactors, flash distillations, and modeling of temperature dependence of reactions and elements of heat transfer.

Additional information

EN: Suitable for doctoral studies.
The course is related to UN's Sustainable Development Goals (SDG):

no poverty, zero hunger, good health and well-being, quality education, gender equality, clean water and sanitation, affordable and clean energy, decent work and economic growth, industry, innovation and infrastructure, reduced inequalities, sustainable cities and communities, responsible consumption and production, climate action, life below water, life and land, peace, justice and strong institutions, partnership for the goals.

Study materials

EN: Lecture notes and links to supplementary material are given in Moodle

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 2. period	5 cr

Course Enrolment	0 cr
Course Assessment	5 cr

BJ02A2041 Advanced Process Design

BJ02A2041 Advanced Process Design

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	5 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Chemical Engineering 100%
Responsible persons	Armi Rissanen, Administrative person Nima Rezaei, Responsible teacher Aliakbar Roosta, Responsible teacher Hung Nguyen, Responsible teacher
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta

Prerequisites

EN: BJ01A5030 Prosessisimuloinnin perusteet (Basics of Process Simulation) or corresponding. It is is strongly recommended that students have taken basic studies in Chemical Engineering or have corresponding knowledge.

Learning outcomes

EN: Upon completion of the module, the student has the following competencies:
– knows what kind of design activities are required during the process design
– understands how product design and process design are related
– knows what is design of processes: where it is aiming and what are the steps
– understands the role of modern simulation package during the process life cycle
– is able to apply a simulation package to support every step during process design.

Content

EN: – Chemical and physical properties, determination of chemical components in process simulation
- Property estimation methods
– Chemical process material and energy balances, sizing, costing and economical evaluation
– Process performance analysis, process evaluation and optimization
– Chemical process synthesis, Biorefinery process synthesis: objectives and steps
– Synthesis of separation sequences
– Energy integration in process design.

Study materials

EN: Basic study material delivered in Moodle.
Specific literature:
– Sinnot R.K., Chemical Engineering
– Sinnot R.K., Chemical Engineering Design,(e-resource)
– Seider W.D., Seader J.D., Lewin D.R.Widago S. Product and Process Design Principles: Synthesis, Analysis and Evaluation
– Al-Malah Kamal I.M., Aspen Plus. Chemical Engineering Applications, (e-resource)

– Biegler L., Grossman I.E., Westerberg A.W.,Systematic methods of chemical process design

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period	5 cr
Course Completion		5 cr

BJ02A2080 Project on Product and Process Design

BJ02A2080 Project on Product and Process Design

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	10 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Chemical Engineering 100%
Responsible persons	Armi Rissanen, Administrative person Tuomas Koiranen, Responsible teacher Arto Laari, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta

Prerequisites

EN: BJ01A5020 Prosessi- ja tehdassuunnittelu (process ; plant design) or equivalent passed.BJ02A2041 Advanced Process Design or equivalent passed.

Equivalences to other studies

BJ02A2070 Project on Process and Plant Design

Learning outcomes

EN: Upon completion of the module, the student will be able to:
Apply chemical engineering knowledge to realizable product and process design.
Perform technical and economical design calculations.
Solve real design problem starting sometimes from limited and incomplete initial information.
Seek and create novel solutions to design problems.

Content

EN: The projects are carried out in groups of five students. The topics are mainly from industry and the design work is done under supervision of industrial partners. The main focus is on energy transition related processes, i.e. carbon capture and utilization, hydrogen economy, and Power-to-X processes, but topics from chemical industry in general, waste treatment and processing, bioprocesses, metal processing, and circular economy, are also possible. A typical topic starts with product analysis covering a brief market survey, comparison of process alternatives, preliminary process design (process flow diagram, mass and energy balances, sizing of main equipment, lay-out, cost and profitability estimation). Different aspects are emphasized in different projects, depending on the topic.

Additional information

EN: Exchange student; please contact the responsible teacher before you enroll on the course.

The course is related to UN's Sustainable Development Goals (SDG):

no poverty, zero hunger, good health and well-being, quality education, gender equality, clean water and sanitation, affordable and clean energy, decent work and economic growth, industry, innovation and infrastructure, reduced inequalities, sustainable cities and communities, responsible consumption and production, climate action, life below water, life and land, peace, justice and strong institutions, partnership for the goals.

Study materials

EN: Course Materials in Moodle. Additional materials.
Tuunila, R., BJ01A5020 Process&Plant Design (In Finnish), course material, 2015.

Branan, C., Rules of Thumb for Chemical Engineers, 3rd ed., Elsevier, USA, 2002.

Walas, S.M., Chemical Process Equipment Selection and Design, 3rd ed., Elsevier, USA, 2012.

http://www.sciencedirect.com/science/book/9780123969590

Towler, G., Sinnott, Principles, Practice and Economics of Plant and Process Design, Butterworth-Heinemann, 2012.

Peters, M.S., Timmerhaus, K.D., Plant Design and Economics for Chemical Engineers, 4th ed., McGraw-Hill, Singapore, 1991.

Loh, H.P., Process Equipment Cost EstimationFinal Report, US Dept. of Energy, 2002

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	10 cr
Course Completion		10 cr

BJ02A2090 Process Simulation and Monitoring Applications

BJ02A2090 Process Simulation and Monitoring Applications

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	5 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Chemical Engineering 100%
Responsible persons	Armi Rissanen, Administrative person Tuomas Koiranen, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta

Prerequisites

EN: BJ01A5030 Prosessien simuloinnin perusteet (Basics of Process Simulation) or corresponding studies. BJ02A2041 Advanced Process Design. It is strongly recommended that students have taken basic studies in Chemical Engineering or have corresponding knowledge.

Equivalences to other studies

BJ02A2061 Product Design

Learning outcomes

EN: Upon completion of the module, the student has the following competencies: Can use statistical data-analysis for process trouble-shooting, and for critical process parameters estimation using MODDE-PRO software. Can set-up experimental data-design using statistical analysis tools, and student is able to analyze data using set of linear equation solvers. Can implement complex process simulation model in ASPEN + using data-fit correlations describing complex bio/chemical reactions, example water purification plant simulation. Can set-up data reconciliation using mass/energy balances and process measurements. Can use machine learning tools for process based trouble-shooting problems (KNIME).

Content

EN: Statistical data-analysis tool for critical process parameters identification using (MODDE-PRO) software: theory&practice, trouble-shooting cases, experimental plan. Water purification plant simulations in ASPEN +: setting up water purification plant for simulating flow parameters such as BOD, COD using plant based process data. Correlations development using MODDE-PRO. Data reconciliation using mass/energy balances and process measurements: theory, data error sources, parameter estimation using data reconciliation. Machine learning in process industries: theory, methods, case examples.

Additional information

EN: ***
The course is related to UN's Sustainable Development Goals (SDG): 7 affordable and clean energy, 9 industry, innovation and infrastructure, 13 climate action

Study materials

EN: Study material delivered in Moodle

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period	5 cr
Course Completion		5 cr

BJ02A3010 Membrane Technology

BJ02A3010 Membrane Technology

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	5 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Chemical Engineering 100%
Responsible persons	Armi Rissanen, Administrative person Mika Mänttäri, Responsible teacher Arto Pihlajamäki, Responsible teacher
Study level	Basic studies

Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: full-digi

Learning outcomes

EN: At the end of the course a student is expected to know how to: - explain the basic terms and membrane processes - interpret observed phenomena in the separation process and their influence to the separation process - compare the feasibility of membrane materials, modules
and manufacturing processes - choose the most appropriate membrane and membrane process for a separation process - identify the possibilities, benefits and limits of membrane processes.

Content

EN: Membrane processes (micro-, ultra- and nanofiltration, reverse osmosis, pervaporation, etc.). Manufacturing membranes, membrane materials and structures, phenomena in membrane processes (fouling, concentration polarisation, etc.). Modules. Separation mechanisms.
Characterisation of membranes. Applications.

Additional information

EN: Note! Biorefineries students who haven´t passed this course yet take instead course BJ04A4010 Membrane Technology in Biorefining to their MSc degree.

Study materials

EN: Lecture presentations and additional material (Moodle): book chapters and articles. Mulder, M., Basic Principles of Membrane Technology, 2nd ed., Kluwer, 1996/2003.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-SummerSummer	5 cr
Course Completion		5 cr

BJ02A3051 Hydrometallurgy

BJ02A3051 Hydrometallurgy

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	5 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Chemical Engineering 100%
Responsible persons	Armi Rissanen, Administrative person Sami Virolainen, Responsible teacher Manivannan Sethurajan, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta; Digital material in Moodle. One laboratory day in Lappeenranta is the only mandatory event.

Learning outcomes

EN: After the course, the students:
- understand the fundamentals of hydrometallurgy.
- are familiar with methods and equipment used in hydrometallurgical processes.
- have perspective on industrial utilization of hydrometallurgy.

Content

EN: Background. Solution chemistry of hydrometallurgical solutions. Leaching. Treatment of leach solutions by solvent extraction, ion exchange and adsorption. Metals recovery by precipitation and electrochemical methods.

Additional information

EN: Suitable for doctoral studies.

Study materials

EN: Lectures and lecture slides. Video material. Supporting material: Some books mentioned in the lectures.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 2. period	5 cr
Course Completion		5 cr

BJ02A3061 Circular Economy for Materials Processing

BJ02A3061 Circular Economy for Materials Processing

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	5 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Chemical Engineering 100%
Responsible persons	Armi Rissanen, Administrative person Miia John, Responsible teacher
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta

Prerequisites

EN: Bachelor in Engineering

Equivalences to other studies

BH60A1201 Indoor Climate Management of Buildings

Learning outcomes

EN: By the end of the course, the students are expected to be able to:
1. Understand basic concepts of circular economy, knowledge on materials flow (raw materials, processing, manufacturing until end-of-life recycling and re-usage), issues and drivers for changes.

2. Recognize impacts (environmental, economic and social) of the current practice of materials processing from a sustainability aspect.
3. Create new business opportunities to re-enter materials into circular economy.
4. Apply processing technologies to accelerate the implementation in business creation.
5. Work as a team member in a development project.

Content

EN: Circular economy and resource efficiency are important aspect in sustainable development within the industry. The course aim is that students gain the skills needed to ensure that circular economy concepts become adopted into the design, development and operation of mainly metal production processes, during its application, end-of-life stage and recycling.
Students carry out project works in groups. The topics are from industry, for example side stream processing in metal and steel producing industry, circular economy, eco-design. Different aspects are emphasized in different projects, depending on the topic.

Additional information

EN: Blended learning
***

The course is related to UN's Sustainable Development Goals (SDG): 6 clean water and sanitation, 7 affordable and clean energy, 9 industry, innovation and infrastructure, 12 responsible consumption and production, 13 climate action, 17 partnership for the goals

Study materials

EN: The course material and the guidance to supplementary material is provided in connection with the different topics.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	5 cr
Course Completion		5 cr

BJ02A4070 Principles of Thermal Gas-Liquid Processes

BJ02A4070 Principles of Thermal Gas-Liquid Processes

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	5 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Chemical Engineering 100%
Responsible persons	Armi Rissanen, Administrative person Kristian Melin, Responsible teacher Samuel Emebu, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta

Prerequisites

EN: BM20A1501 Numerical Methods or equivalent, BM20A4301 Introduction to Technical Computation or equivalent

Learning outcomes

EN: Student understands distillation, evaporation and gas scrubbing technologies, including equipment structures and sizing principles. Student can design gas-liquid contactors by hand, is able to form mathematical calculation models, and can apply equations for computer simulation.

Content

EN: Gas-liquid contactor theory, sizing principles and equations, calculation examples, computer exercises. Distillation, evaporation, gas scrubbing.
In more details described. MATLAB based solution for continuous reactor case. Distillation principles, McCabe-Thiele method for distillation design. Distillation process (trays, reboiler, condenser, reflux), distillation efficiencies, thermodynamics. Mass balances, phase equilibrium calculations (MATLAB). Pxy-diagram, Flash distillation, Bubble temperature calculation, dew temperature calculation, Txy-diagram formulation, Batch distillation simulation program development (MATLAB). Absorption/gas scrubbing Equipment and Structures, sizing equations, Absorber sizing using MATLAB. Evaporation principles, equipment, sizing, sequencing.

Additional information

EN: NOTE: This course is a combination of BJ02A2011 Modelling of Unit Operations and BJ01A4110 Yksikköoperaatioiden mitoitus B.
The course is mainly aimed for the students of Biorefineries.

***
The course is related to UN's Sustainable Development Goals (SDG): 7 affordable and clean energy, 9 industry, innovation and infrastructure, 13 climate action

Study materials

EN: Lecture notes 90 pages including exercise materials.
Course books:Niket S. Kaisare, Computational Techniques for Process Simulation and Analysis Using MATLAB®, Taylor;Francis, 2017Hussein K. Abdel-Aal, Chemical Engineering Primer with Computer Applications, Taylor;Francis, 2016Felder, R.M., Elementary Principles of Chemical Processes, Wiley, 2004

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 2. period	5 cr
Course Completion		5 cr

BJ03A1011 Introduction to Water Treatment Technologies

BJ03A1011 Introduction to Water Treatment Technologies

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	5 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Chemical Engineering 100%
Responsible persons	Armi Rissanen, Administrative person Susana Rodriguez Couto, Responsible teacher

Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Blending teaching; Mikkeli (contact teaching)

Prerequisites

EN: As an introductory course (with the 1st lecture on conventional water treatment technologies), Laboratory safety course (BJ02A0060) should be completed before participating in the laboratory sessions of the course.

Recommended prerequisites

BJ02A0060 Laboratory Safety Course

Equivalences (free text field)

EN: Replaces the course BJ03A1010 Introduction to Advanced Water Treatment, 5 ECTS

Learning outcomes

EN: By the end of the course, the student is expected to be able to: describe conventional and advanced biological, chemical and physical treatment of contaminated water and wastewater; and to suggest suitable treatment method(s) based on the composition of the water/ wastewater and the efficiency of the studied technology(ies).

Content

EN: Learning the principles of water treatment techniques such as biological methods, coagulation/flocculation, adsorption/ion exchange, advanced oxidation processes (AOPs), membrane technology, and electrochemical methods. Comparison of different water treatment techniques will be considered in the course from economic, environmental and technical perspectives. Problem-based learning (PBL) using real case scenarios will be conducted as a group work. Weekly homework assignments related to the topic of each week will be proposed (to be prepared individually or in groups).

Additional information

EN: Suitable for doctoral studies.
The course is related to UN's Sustainable Development Goals (SDG): 6 clean water and sanitation.

Study materials

EN: Lecture notes. Moodle. Literature from published scientific articles and from the teacher's own books.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period	5 cr
Course Completion		5 cr
Method 2	Recurrence 1: 1. period	5 cr
Course Completion		5 cr

BJ03A1020 Biological Waste Water Treatment

BJ03A1020 Biological Waste Water Treatment

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	5 cr
Languages	English

Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Chemical Engineering 100%
Responsible persons	Armi Rissanen, Administrative person Susana Rodriguez Couto, Responsible teacher Mika Mänttäri, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Full digi

Prerequisites

EN: BJ03A01010 Introduction to Advanced Water Treatment is recommended or corresponding knowledge.

Learning outcomes

EN: After completing the course the student will have the basic knowledge of aerobic and anaerobic biological treatment processes. He/she will master the basic principles, terminology, reactor configurations, and related calculations of both processes. He/she understands the context of the biological waste water treatment processes to recycling of nutrients, bioenergy production and recovery and production of value-added compounds from waste waters and organic wastes. In addition, the student will after completing the course use the available literature in his/her research work, act as a part of a project work group and evaluate his/her own performance and communicate in a professional way in the project group.

Content

EN: Biological wastewater treatment methods, professional terminology, built-up ecosystem, desired metabolism and reactor types, selection of microbes and enrichment, influence of temperature and other conditions on above-mentioned factors, basic knowledge on the biological methods used in removal of carbon, nitrogen and phosphorous, aerobic and anaerobic wastewater treatment, process alternatives and technologies, designing and operating modes of processes, controlling and optimization of processes, novel technologies, recovery of valuable products from waste originating (secondary raw materials) raw materials, aerobic and anaerobic technologies in the treatment of sewage sludges and organic wastes.

Additional information

EN: Suitable for doctoral studies.
Note! Biorefineries students who haven´t passed this course yet take instead course BJ04A6010 Biological Waste Water Treatment in Biorefining to their MSc degree.
The course is related to UN's Sustainable Development Goals (SDG): 6 clean water and sanitation, 11 sustainable cities and communities

Study materials

EN: Lecture material and additional material (Moodle), literature announced during the course.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-Summer	5 cr
Course Completion		5 cr

BJ03A1040 Advanced Materials in Adsorption and Ion Exchange

BJ03A1040 Advanced Materials in Adsorption and Ion Exchange

Curriculum period	2024-2025

Validity period	since 1 Aug 2024
Credits	5 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Chemical Engineering 100%
Responsible persons	Armi Rissanen, Administrative person Youssef El Ouardi, Responsible teacher John Bediako, Responsible teacher
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta

Prerequisites

EN: BJ03A1040-Advanced Materials in Adsorption and Ion Exchange

Recommended prerequisites

BJ03A1011 Introduction to Water Treatment Technologies

Learning outcomes

EN: Towards the completion of this course, the student is expected to fulfill the following criteria:
-To describe the conventional and novel adsorption/ion-exchange materials.

-To describe the conventional and novel applications of adsorption and ion-exchange.

-To select an appropriate adsorption/ion-exchange material for a particular purpose according to the composition of the water to be purified.

-To understand the theory and the mechanism in adsorption processes.

-Use of theoretical models to describe the adsorption kinetics, isotherms, and thermodynamics.

-To solve the adsorption/ion exchange based water purification case studies.

Content

EN: - Introduction to adsorption and ion exchange theories.
- Learning the types and properties of conventional and novel adsorption and ion exchange materials and their applications in water research.

- Learning to evaluate the economic and environmental aspects of the production and use of different adsorption and ion exchange materials.

- Learning the surface reactions and theories behind the adsorption and ion exchange phenomena.

- Ultimately, identifying the necessary tools to effectively deal with various environmental issues and industrial challenges using advanced materials in adsorption and ion exchange processes.

-Case studies relevant to the process, implementation to water treatment and seminar works to provide in-depth knowledge of adsorption/ion-exchange-based water purification.

-Carrying out individual and group works, including problem-based learning (PBL), quizzes and assignments.

Additional information

EN: The course is related to the UN's Sustainable Development Goals (SDG): good health and well-being (goal 3) and clean water and sanitation (goal 6). The course is particularly suitable and recommended to PhD students.

Study materials

EN: Lecture notes, Moodle, scientific articles, and teachers' handbooks

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 2. period	5 cr
Course Completion		5 cr

BJ03A2040 Research Project Course in Water Treatment

BJ03A2040 Research Project Course in Water Treatment

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	10 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Chemical Engineering 100%
Responsible persons	Armi Rissanen, Administrative person Amit Bhatnagar, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Mikeli

Prerequisites

EN: BJ03A1010 Introduction to Water Treatment

Recommended prerequisites

BJ03A2010 Advanced Oxidation Processes & Electrochemical Methods in Water Treatment

BJ03A1040 Advanced Materials in Adsorption and Ion Exchange

BJ02A0060 Laboratory Safety Course

Learning outcomes

EN: By the end of the course, here are the main objectives for the students to achieve after taking this course:
(i) The student is expected to be able to carry out a research project step by step: Planning, implementation, data collection and analysis and reporting of analyzed results in a written form;

(ii) The student is expected to search useful literature from different types of database platforms and to utilize the background information for the laboratory work and project work;

(iii) The student is expected to prepare a scientific report from the work conducted in the laboratory and project work;

(iv) The student is expected to report and deliver the conducted work through oral presentation.

Content

EN: Planning, implementation, and reporting a research project related to the water treatment process. The project includes a planning experimental laboratory work, conducting experimental work in the lab, analyzing the results and reporting (written and oral). Lectures and seminar related to the project work are included. The lectures are planned during weeks 37 to 41 and the laboratory experiments, which will be conducted in Mikkeli will be carried out during week 46 (group work). The info about project work will be given later on the course Moodle page after discussing with companies and research groups.

Additional information

EN: Laboratories/lab work will be in Mikkeli.
Laboratory safety course (BJ02A0060) should be completed before participating in the laboratory sessions of this course.

****

The course is related to UN's *Sustainable Development Goals* (*SDGs*) Sustainable Development Goals (SDGs) 6: Clean Water and Sanitation for All.

Study materials

EN: Lecture materials. Literature from the field of the project's topic.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	10 cr
Course Completion		10 cr

BJ02A0011 Laboratory Work Course in Chemical Technology

BJ02A0011 Laboratory Work Course in Chemical Technology

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	10 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Chemical Engineering 100%
Responsible persons	Armi Rissanen, Administrative person Ritva Tuunila, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta

Prerequisites

EN: In case of laboratory work laboratory safety training organized by the department is required before starting any experiments.

Learning outcomes

EN: Upon completion of the module, the student will be able to carry out independently a small research project (the content of the module varies).

Content

EN: A specific project will be done in one of the laboratories of the department. The project is planned together with the supervisor(s) and consists mainly of laboratory work, literature work and report writing. The course may contain lectures and seminars. The project may also be planned together with industry and then carried out at an industrial location.

Additional information

EN: The course is intended for pre-planned study visits prior agreed with a supervising professor. The students planning to register for the course must contact head of degree programme and possible supervisor beforehand. To be able to start work in the laboratory a student must take and pass laboratory safety training.
The course is related to UN's Sustainable Development Goals (SDG): 6 clean water and sanitation, 9 industry, innovation and infrastucture, 13 climate action

Study materials

EN: Literature related to the project.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period Recurrence 2: 3. period-4. period	10 cr
Course Completion		10 cr

BJ02A0012 Advanced Laboratory Course in Chemical Technology

BJ02A0012 Advanced Laboratory Course in Chemical Technology

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	30 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Chemical Engineering 100%
Responsible persons	Armi Rissanen, Administrative person Ritva Tuunila, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta

Learning outcomes

EN: Upon completion of the module, the student will be able to carry out independently a small research project (the content of the module varies).

Content

EN: A specific project will be done in one of the laboratories of the department. The project is planned together with the supervisor(s) and consists mainly of laboratory work, literature work and report writing. The course may contain lectures and seminars. The project may also be planned together with industry and then carried out at an industrial location.

Additional information

EN: The course is intended for pre-planned study visits prior agreed with a supervising professor. The students planning to register for the course must contact head of degree programme and possible supervisor beforehand. To be able to start work in the laboratory a student must take and pass laboratory safety training.
The course is related to UN's Sustainable Development Goals (SDG): 6 clean water and sanitation, 9 industry, innovation and infrastucture, 13 climate action

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period Recurrence 2: 3. period-4. period	30 cr
Course Completion		30 cr

BJ02A0050 Orientation to M.Sc. Studies

BJ02A0050 Orientation to M.Sc. Studies

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	1 cr
Languages	English
Grading scale	Pass-Fail
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Chemical Engineering 100%
Responsible persons	Armi Rissanen, Administrative person Ritva Tuunila, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta

Learning outcomes

EN: After completing the course, the student
- is familiar with the formal requirements of his/her studies and with the campus services and their appropriate use during his/her studies

- know the importance of sufficient study skills in university studies

- is aware of information security issues

- possesses ability for information searching

- know how to refer scientific literature

- is aware of job hunting procedure.

Content

EN: During the course the student will learn about the relevant instructions affecting his/her studies and how to generate a personal study plan. The student will familiarize him/herself with the relevant staff of his/her degree programme and with the services provided by e.g. the Library and Study Services. The student will learn about the relevant laboratory safety instructions.

Additional information

EN: Teaching is organized jointly for all Master's Programmes in Chemical Engineering. Can be studied online except practical test in laboratory.
The course is related to UN's Sustainable Development Goals (SDG): 4 quality education, 5 gender equality

Study materials

EN: Moodle material

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	1 cr
Course Completion		1 cr
Method 2	Recurrence 1: 1. period-2. period	1 cr
Course Completion		1 cr

BJ02A6020 Power-to-X processes

BJ02A6020 Power-to-X processes

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	5 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Chemical Engineering 100%
Responsible persons	Armi Rissanen, Administrative person Arto Laari, Responsible teacher
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta

Learning outcomes

EN: Upon completion of the module students will have an overview of the current trends in chemical industry to replace fossil-based products with products manufactured from renewable electricity.

Content

EN: The course covers recent topics in chemical engineering related to energy transformation, including generation of renewable hydrogen, carbon capture and utilization, E-fuels, Power-to-X processes, and carbon neutral products and processes.

Additional information

EN: Full digi

The course is related to UN's Sustainable Development Goals (SDG):

no poverty, zero hunger, good health and well-being, quality education, gender equality, clean water and sanitation, affordable and clean energy, decent work and economic growth, industry, innovation and infrastructure, reduced inequalities, sustainable cities and communities, responsible consumption and production, climate action, life below water, life and land, peace, justice and strong institutions, partnership for the goals.

Study materials

EN: Video lectures, lecture notes and other material given by the teacher

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-Summer	5 cr
Course Completion		5 cr
Method 2	Recurrence 1: 1. period-Summer	5 cr
Course Completion		5 cr

BM30A0550 Photonics

BM30A0550 Photonics

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	6 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Computational Engineering 100%
Responsible persons	Jonna Naukkarinen, Administrative person Erik Vartiainen, Responsible teacher
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta

Prerequisites

EN: Students are recommended to have completed a basic course in physics.

Learning outcomes

EN: After the course a student:
1. knows the basic properties of waves and wave motion,
2. understands the material polarization phenomenon as the ultimate source of light,
3. knows the basic properties and physics of laser action,
4. knows the ideas and applications of ultrafast optics,
5. knows the basic physics and applications of nonlinear optics,
6. knows the Fresnel-equations, and understand accordingly the physics of light reflection and refraction,

7. knows the basics of light polarization, the corresponding applications and the Jones matrix formulation,
8. understands the meaning of spatial and temporal coherence of light, and their implications for the technical applications, such as FTIR spectroscopy,
9. knows the ABCD-matrix formulation for geometrical optics,
10. knows the basics of laser imaging: one- and two-photon confocal microscopy, spectral imaging, and fluorescence nanoscopy,
11. understands the physics of producing slow and fast light, and knows their applications,
12. understands diffraction of light, and its applications.

Content

EN: 1. Wave motion and wave equations,
2. Maxwell equations and electromagnetic spectrum,
3. Lasers,
4. Ultrafast lasers,
5. Fresnell equations,
6. Polarization and optical activity,
7. Geometrical optics,
8. Coherence,
9. Interference and diffraction,
10. Nonlinear optics,
11. Optical microscopy and nanoscopy,
12. Slow and fast light, THz-optics,
13. Attosecond optics,
14. Coherent control.

Study materials

EN: Lecture material available in Moodle (slides and videos), based partly on textbooks: 1. Eugene Hecht, Optics, 4th edition (Addison-Wesley, 2002). 2. G. R. Fowles, Introduction to Modern Optics, 2nd edition, (Holt, Rinehart and Winston, New York, 1976). 3. R. W. Boyd, Nonlinear Optics (Academic Press, San Diego, 1992). 4. Y. R. Shen, The Princples of Nonlinear Optics (Wiley, New York, 1984).

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 2. period	6 cr
Course Enrolment		0 cr
Course Assessment		6 cr

BM40A0702 Pattern Recognition and Machine Learning

BM40A0702 Pattern Recognition and Machine Learning

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	6 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Computational Engineering 100%
Responsible persons	Jonna Naukkarinen, Administrative person Tarja Pettinen, Administrative person Lasse Lensu, Responsible teacher
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta

Prerequisites

EN: Ability to program in Matlab or Python.

Recommended prerequisites

BM20A8601 Statistics I

BM20A8700 Matrix Calculus

BM40A1601 Foundations of Artificial Intelligence and Machine Learning

BM20A7102 Statistics II

Learning outcomes

EN: The student is able to 1) understand pattern recognition problems and the common approaches to solve them based on data-driven machine learning, 2) properly utilise the available data, compare and apply appropriate pattern recognition methods, 3) implement a working solution for a specific problem and 4) evaluate the performance of and validate a pattern recognition method.

Content

EN: Introduction to pattern recognition and supervised, unsupervised and reinforcement learning. Feature extraction and selection, system evaluation. Linear and non-linear classifiers based on linear models, kernel methods, artificial neural networks and support vector machines. Statistical pattern recognition, Bayesian inference and parameter estimation. Context-dependent and reinforcement learning. Practical pattern recognition and method-independent learning.

Additional information

EN: ***
The course is related to UN's Sustainable Development Goals (SDG): 8 decent work and economic growth, 9 industry, innovation and infrastructure.

Study materials

EN: Lecture slides, recorded videos and demonstrations in Moodle and additional literature.

Literature

Bishop, C.M., 2006. Pattern Recognition and Machine Learning. Springer, New York

Duda, R.O., Hart, P.E., Stork, D.G., 2001. Pattern classification, 2nd edition. Wiley, New York

Theodoridis, S., Koutroumbas, K., 2003. Pattern recognition, 2nd ed. ed. Academic Press, Amsterdam#; Boston.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	6 cr
Course Enrolment		0 cr
Course Assessment		6 cr

BM40A1201 Digital Imaging and Image Preprocessing

BM40A1201 Digital Imaging and Image Preprocessing

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	6 cr

Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Computational Engineering 100%
Responsible persons	Jonna Naukkarinen, Administrative person Henri Petrow, Responsible teacher Tarja Pettinen, Administrative person Erik Vartiainen, Responsible teacher Xin Liu, Responsible teacher
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta

Prerequisites

EN: Recommended BM20A4301 Johdatus tekniseen laskentaan, BM20A5001 Principles of Technical Computing, BM40A0502 Johdatus laskennalliseen älykkyyteen ja koneoppimiseen, or equivalent knowledge.

Learning outcomes

EN: A student knows how radiation interacts with matter, how images can be captured and the image formation modelled, and how preprocessed images can be used for measurement purposes. The student is able to characterize imaging and the factors affecting it, and affect image quality in practice. Student is able to design and implement practical imaging systems.

Content

EN: Electromagnetic radiation and light interaction with matter, sources of radiation and illumination techniques, imaging sensors and manufacturing technologies, spectroscopy, imaging optics, sensor and image acquisition modelling and characterisation, digital image encoding and characteristics, image preprocessing techniques, and image-based measurements.

Additional information

EN: The course is related to UN's Sustainable Development Goals (SDG): 9 industry, innovation and infrastructure.

Study materials

EN: Lecture material (slides and videos) available in Moodle, based partly on textbooks:
(1) Kasap, S.O.: Optoelectronics and Photonics, Prentice-Hall, 2000.

(2) Gonzales, R.C., Woods, R.E.: Digital image processing, Prentice-Hall, 2018.

(3) Jain, A.K.: Fundamentals of digital image processing, Prentice-Hall, 1989.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	6 cr
Course Enrolment		0 cr
Course Assessment		6 cr

BM20A7401 Inverse Problems

BM20A7401 Inverse Problems

Curriculum period	2024-2025

Validity period	since 1 Aug 2024
Credits	5 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Computational Engineering 100%
Responsible persons	Jonna Naukkarinen, Administrative person Tapio Helin, Responsible teacher Tarja Pettinen, Administrative person
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: This course discusses typical inverse problems and related mathematical methodology.

Prerequisites

EN: Bachelor level studies in mathematics. Completion of the course BM20A7300 Functional analysis or a similar course is a recommended prerequisite.

Equivalences (free text field)

EN: Replaces BM20A6200 Inverse Problems and Normed Spaces together with course BM20A7300 Functional Analysis.

Learning outcomes

EN: The student learns
- how to recognize an inverse problem,

- the main challenges related to them (instability, non-uniqueness) and

- knows the main computational approaches to solve them.

Content

EN: Inverse problems appear in several fields, including medical imaging, image processing, mathematical finance, astronomy, geophysics, nondestructive material testing and sub-surface prospecting. Typical inverse problems arise from asking simple questions "backwards". For instance, the simple question might be "If we know precisely the structure of the inner organs of a patient, what kind of X-ray images would we get from her?" The same question backwards is "Given a set of X-ray images of a patient, what is the three-dimensional structure of her inner organs?" This is the inverse problem of Computerized Tomography, or CT imaging.
Usually the inverse problem is more difficult than the simple question that it reverses. Successful solution of inverse problems requires specially designed algorithms that can tolerate errors in measured data.

Additional information

EN: ***
The course is related to UN's Sustainable Development Goals (SDG): 9 industry, innovation and infrastructure

Study materials

EN: Lecture notes based on various materials. Recommended reading includes Kirsch: An Introduction to the Mathematical Theory of Inverse Problems, Springer 2011.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 2. period	5 cr
Course Enrolment		0 cr
Course Assessment		5 cr

BM20A7601 Numerical Methods for Partial Differential Equations

BM20A7601 Numerical Methods for Partial Differential Equations

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	5 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Computational Engineering 100%
Responsible persons	Jonna Naukkarinen, Administrative person Andreas Rupp, Responsible teacher Tarja Pettinen, Administrative person
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta, blended learning

Prerequisites

EN: Analysis in integer dimensions

- notion of a (classical, continuous) derivative, a gradient, a divergence, and a Laplacian
- *not mandatory:* notion of a weak derivative
- Lebesgue integration (also on manifolds)
- Gauss's divergence theorem and integration by parts

Linear algebra

- notion of a matrix, a vector, and a point
- solve a matrix-vector system using Gaussian elimination and LU decomposition

Linear functional analysis

- notion of a vector space, a Banach space, and a Hilbert space
- *not mandatory:* notion of a Sobolev space
- properties of Lebesgue spaces

Learning outcomes

EN: Answers to the following questions

- What is a partial differential equation (PDE)?
- How are PDEs used in science and technology?
- When is a PDE well-posed?
- How can we approximate a solution to a PDE using finite elements?
- How can big matrices be stored and matrix-vector systems be solved in the computer?

Content

EN: Basics of partial differential equations

- Modeling with PDEs
- The stationary diffusion–advection–reaction equation
- Existence and uniqueness of weak solutions

Construction of the finite element method

- Meshes
- Test and trial functions
- Transformation of finite elements
- Obtaining the system of linear equations

Analysis of the finite element method

- Consistency, error orthogonality, and best approximation
- Error estimates in the energy norm
- Error estimates in Lebesgue norms
- Condition numbers of finite element matrices

Direct methods for sparse linear systems of equations

- LU decomposition without pivoting
- Data structures
- Bandwidth reduction

Iterative methods for systems of linear equations

- Linear stationary iterative methods
- Gradient and conjugate gradient methods
- Preconditioned conjugate gradient method

Additional information

EN: The course is related to UN's Sustainable Development Goals (SDG):

4 quality education
5 gender equality
9 industry, innovation and infrastructure
10 reduced inequalities
13 climate action
14 life below water
15 life and land

Study materials

EN: The course heavily relies on the content of the following monographs. They are ordered according to their influence on the course's manuscript.

- P. Knabner and L. Angerman. *Numerical Methods for Elliptic and Parabolic Partial Differential Equations: With contributions by Andreas Rupp*. 2nd ed. Vol. 44. Texts in Applied Mathematics. Springer International Publishing, 2021. doi:10.1007/978-3-030-79385-2
- D. Kuzmin and J. Hämäläinen. *Finite Element Methods for Computational Fluid Dynamics: A Practical Guide. Computational Science and Engineering*. Society for Industrial and Applied Mathematics, 2014. doi:10.1137/1.9781611973617
- A. Ern and J.-L. Guermond. *Finite Elements*. 1st ed. Vol. 72–74. Texts in Applied Mathematics. See Manuscript for details. Springer International Publishing, 2021

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 2. period	5 cr
Course Assessment		5 cr

Course Enrolment		0 cr
Method 2	Recurrence 1: 2. period	5 cr
Course Enrolment		0 cr
Course Assessment, continuous		5 cr

BM20A8501 Probabilistic Simulation

BM20A8501 Probabilistic Simulation

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	5 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Computational Engineering 100%
Responsible persons	Jonna Naukkarinen, Administrative person Tomas Soto, Responsible teacher
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Prerequisites

EN: BM20A7102 Tilastomatematiikka II or corresponding background knowledge highly recommended.

Compulsory prerequisites

BM20A9000 Principles of Technical Computing for MSc Students

Equivalences (free text field)

EN: Replaces course BM20A6500 Simulation and System Dynamics 6 op together with course A220A6501 System Dynamics with Applications 3 op.

Learning outcomes

EN: The course gives an introduction to the concepts of discrete simulation models and methods together with numerical examples. After the course, the student is able to create and use different simulation models to solve practical problems. Among the discrete-event based models, the student is able to simulate basic queuing, server, scheduling systems and implement stochastic dynamical simulations.

Content

EN: Basic concepts of discrete systems. Model-based design, basic simulation workflow, running the simulations and interpreting the results. Random numbers, discrete event generation by random numbers. Statistical and empirical distributions for event generation. Basics of stochastic differential equations. Building numerical simulation examples with MATLAB. Application examples: queuing systems, storage size optimization, stochastic dynamical systems and agent-based modelling.

Study materials

EN: Lecture notes, MATLAB examples and weekly assignments. To be given in the course homepage.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 2. period	5 cr
Course Enrolment		0 cr
Course Assessment		5 cr

BM20A6100 Advanced Data Analysis and Machine Learning

BM20A6100 Advanced Data Analysis and Machine Learning

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	6 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Computational Engineering 100%
Responsible persons	Jonna Naukkarinen, Administrative person Lasse Lensu, Responsible teacher Satu-Pia Reinikainen, Responsible teacher
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta

Prerequisites

EN: Ability to program in Matlab or Python.

Recommended prerequisites

BM20A3003 Statistical Parameter Estimation

BM40A0702 Pattern Recognition and Machine Learning

Learning outcomes

EN: The student is able to 1) pre-process, visualise and analyse multivariate synthetic and real-world data, 2) understand and use state-of-the-art regression methods and machine learning and 3) apply the studied methods to perform data analysis, analyse the results and report the findings.

Content

EN: Characteristics and pre-processing of data, linear and nonlinear dimensionality reduction. Logistic, multivariate statistical methods and advanced extensions of the methods. Deep neural networks, semi-supervised learning and generative models. Case-based topics on data analysis and machine learning.

Additional information

EN: The course is related to UN's Sustainable Development Goals (SDG): 8 decent work and economic growth, 9 industry, innovation and infrastructure

Study materials

EN: Lecture material, recorded videos and demonstrations in Moodle and additional literature.

Literature

Martinez, W.L., Martinez, A.R., Solka, J.L., 2011. Exploratory data analysis with MATLAB, 2nd ed., CRC Press, Boca Raton, Fla

https://d2l.ai/

https://www.deeplearningbook.org/

Brunton, S. L., Kutz, J. N., 2019, Data-Driven Science and Engineering: Machine Learning, Dynamical Systems, and Control, Cambridge University Press, UK

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	6 cr
Course Enrolment		0 cr
Course Assessment		6 cr
Method 2	Recurrence 1: 1. period-2. period	6 cr
Course Enrolment		0 cr
Midterm-Exam 1		0 cr
Midterm-Exam 2		6 cr

BM20A7200 Bayesian Continuous-Parameter Estimation

BM20A7200 Bayesian Continuous-Parameter Estimation

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	5 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Computational Engineering 100%
Responsible persons	Jonna Naukkarinen, Administrative person Lassi Roininen, Responsible teacher Tarja Pettinen, Administrative person
Study level	Postgraduate studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Continuous-parameter model estimation in the sense of Bayesian statistics

Prerequisites

EN: This course is relevant for all those students who want to develop mathematical and statistical models and methods to be deployed in science, engineering, and finance. Those students who mainly wish to utilise methods for problems are encouraged to attend other LUT courses.

Compulsory prerequisites

BM20A3003 Statistical Parameter Estimation

or

LaKLate Computational Engineering

Learning outcomes

EN: The target is that the students can form research questions related to Bayesian continuous-parameter models which can be further pursued in MSc thesis or PhD thesis research projects.

Content

EN: This is a research level course mainly intended to final year MSc students and PhD students. The exact content is always agreed with the students. Topics include, but are not limited to, connections between deep Gaussian processes, deep neural networks and stochastic differential equations; implementation needed sampling methods with MCMC, variational Bayes or optimisation as needed; mixture of Gaussian process experts; high-performance computing and random field models for Bayesian inversion.

Additional information

EN: Main audience are PhD and final year MSc students

Study materials

EN: Andrew Gelman, John Carlin, Hal Stern, David Dunson, Aki Vehtari, and Donald Rubin, Bayesian Data Analysis, 2021.
Simo Särkkä, and Arno Solin, Applied Stochastic Differential Equations, 2019.

Simo Särkkä, Bayesian Filtering and Smoothing, 2013.

Christian P Robert, and George Casella, Monte Carlo Statistical Methods, 2004.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period	5 cr
Course Completion		5 cr

BM20A9001 Numerical Simulation

BM20A9001 Numerical Simulation

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	5 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Computational Engineering 100%
Responsible persons	Jonna Naukkarinen, Administrative person Lassi Roininen, Responsible teacher Tarja Pettinen, Administrative person Miracle Amadi, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta

Prerequisites

EN: Knowledge of the basic usage and programming syntax of Matlab and some level of Mathematical background for instance, calculus, ordinary differential equations, and optimization.

Equivalences to other studies

BM20A5002 Principles of Technical Computing

Equivalences (free text field)

EN: Replaces the course BM20A9000 Principles of Technical Computing for MSc Students,

Learning outcomes

EN: Throughout the course, students will gain practical hands-on experience in using MATLAB for problem-solving in linear algebra, differential equations, optimization, and statistical analysis parameter estimation results. The em- phasis will be on both theoretical understanding and practical application, equipping students with the skills needed for technical problem-solving in diverse fields.

Content

EN: Linear Algebra:
- solving systems of linear equations (using both matrix form and symbolic math toolbox).

- Singular value decomposition (SVD) with applications in, for in- stance, image reconstruction, solving linear equations, data com- pression, etc.

ODEs and DAEs:

- Solving ODEs analytically and numerically (using both symbolic and numeric methods);

- Solving DAEs numerically.

- Applications in various dynamical systems.

Optimization:

- Description of the general form of a model.

- Linear least squares estimation in Matlab (using Matlab back- slash)

- Parameter estimation for nonlinear models using Matlab fmin- search optimizer

- Specific purpose alternatives: lscurvefit and polyfit

Various applications with both dynamic models and algebraic models.

Statistics:

- Basics: sample statistics

- Statistics for linear models: Covariance of estimates using coeffi- cient matrix, t-values, R-square value, crossvalidation.

- Statistics for nonlinear models: Covariance of estimates by com- puting the Jacobian matrix (analytically and numerically)

- Alternative ways to obtain the statistics of parameter estimates: Adding noise to data, Bootstrapping

- Various applications with both dynamic models and algebraic models.

Study materials

EN: Lecture material available in Moodle

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period	5 cr
Course Completion		5 cr

BM20A7300 Functional Analysis

BM20A7300 Functional Analysis

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	5 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Computational Engineering 100%

Responsible persons	Jonna Naukkarinen, Administrative person Tapio Helin, Responsible teacher Tarja Pettinen, Administrative person
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: This course describes some theoretical foundations of modern mathematics and discusses connections to computational mathematics.

Prerequisites

EN: Bachelor level studies in mathematics.

Equivalences (free text field)

EN: Replaces BM20A6200 Inverse Problems and Normed Spaces together with course BM20A7400 Introduction to Inverse Problems.

Learning outcomes

EN: Basic concepts in functional analysis including norm, linear operator, Hilbert spaces and compact set. Strengthening abilities to prove rigorous mathematical statements.

Content

EN: Functional analysis is a classical field of mathematics, which aims to describe general vector spaces (e.g. function spaces or graphs) and mappings defined on these spaces, and aims to characterize their relationships and properties. Functional analysis offers tools for deeper understanding of many mathematical phenomena such as Fourier transform or numerical analysis. The topic of functional analysis is contemporary, since the data masses studied in modern science are often vast and high-dimensional. It is necessary to understand how different mappings between such data sets scale as the size or the dimension of the data increases.

Additional information

EN: ***
The course is related to UN's Sustainable Development Goals (SDG): 9 industry, innovation and infrastructure

Study materials

EN: Lecture notes (mostly based on Rynne and Youngson: Linear Functional Analysis 2008)

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period	5 cr
Course Assessment		5 cr
Course Enrolment		0 cr

BL20A1300 Energy Resources

BL20A1300 Energy Resources

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	6 cr

Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LES, Electrical Engineering 100%
Responsible persons	Minna Loikkanen, Administrative person Christian Breyer, Responsible teacher Ashish Gulagi, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta

Prerequisites

EN: Basic background in energy and engineering mathematics.

Learning outcomes

EN: Upon completion of the course the student will be able to: 1. Identify the constraints and potentials of all relevant energy resources in a global context. 2. Describe all relevant energy conversion technologies on the basis of their energy resource. 3. Analyse the principal structure of future energy systems on the basis of energy resource characteristics. 4. Describe the special relevance of wind energy and solar energy in the ongoing energy transition.

Content

EN: The course provides an overview of the availability of energy resources and related emissions and techno-economic maturity of related energy conversion technologies, which induces a fundamental structure for the future energy system and the related energy transition pathway. The course comprises the main energy resources for the current and future energy system: crude oil, natural gas, coal, uranium, hydro power, bioenergy, solar energy, wind energy, geothermal energy, and ocean energy. These energy resources have different theoretical, technical and economic potentials as well as geographic variations in availability. The resources also differ considerably in the impact of the emissions related to the respective energy conversion technologies being relevant for the degree of sustainability. A broad variety of energy conversion technologies at different levels of maturity are used for utilising the resources.

Additional information

EN: The course is related to UN's Sustainable Development Goals (SDG): 7 affordable and clean energy, 13 climate action

Study materials

EN: Material handed out in class and made available on Moodle.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	6 cr
Course Assessment		6 cr
Course Enrolment		0 cr
Method 2	Recurrence 1: 1. period-2. period	6 cr
Course Assessment		6 cr
Course Enrolment		0 cr

BL20A0601 Electrical Power Transmission

BL20A0601 Electrical Power Transmission

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	5 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LES, Electrical Engineering 100%
Responsible persons	Minna Loikkanen, Administrative person Jouni Haapaniemi, Responsible teacher Behnam Mohammadiivatloo, Responsible teacher
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta / full digi

Recommended prerequisites

BL20A0710 Introduction to Electrical Power Systems

or

BL30A0001 Electric Circuits

or

BL30A0100 Electric Circuit Analysis

Equivalences to other studies

BL20A0600 Electrical Power Transmission

Learning outcomes

EN: Upon completion of the course the student will be able to: 1. describe the operation principle of an electric power system, 2. explain and determine the principles of frequency and voltage control in an electric power system, including the special features of the Nordel system, 3. calculate the power flow and fault currents in meshed power transmission systems, 4. calculate the static and transient stability of a single generator, 5. describe the basic techniques and application targets of DC transmission, 6. explain the implementation principles of fault protection in a meshed power transmission network.

Content

EN: 1. Overview of electric power transmission systems, Finnish power system, and Nordic market 2. Modeling of transmission systems 3. Active power and frequency control 4. Reactive power and voltage control 5. Power flow calculations 6. Short circuit studies 7. Stability analysis 8. Protection of transmission network 9. High voltage direct current transmission

Additional information

EN: The course is related to UN's Sustainable Development Goals (SDG): 7
affordable and clean energy

Study materials

EN: Course Notes; Textbooks

Literature

Power System Analysis and Design Book by J. Duncan Glover and Mulukutla S Sarma

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 2. period	5 cr
Course Completion		5 cr

BL30A1440 Electric and Hybrid Vehicle Powertrains

BL30A1440 Electric and Hybrid Vehicle Powertrains

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	4 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LES, Electrical Engineering 100%
Responsible persons	Lasse Laurila, Responsible teacher Minna Loikkanen, Administrative person
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Prerequisites

EN: Basics of electrical engineering, power electronics and electric drives recommended.

Recommended prerequisites

BL30A1300 Power Electronic Converters

BL30A0510 Introduction to Electrical Drives

Equivalences to other studies

BL40A2910 Electric Energy Conversion Systems

Learning outcomes

EN: The student knows the most relevant electric and hybrid powertrain solutions in several vehicle types, including road and off-road vehicles, marine, rail traffic and aviation applications.
The student acquires knowledge of the drivers to electric and hybrid vehicle powertrains, requirements, technology (power electronics, electric machines, energy storages, mechanics), drive cycles, dimensioning and design.

The student is able to

- make basic system design, component selection and dimensioning according to application specifications

- document and present orally the results of the seminar work

- provide both written and oral peer review

Content

EN: Electric and hybrid powertrain solutions in several vehicle types, including road and off-road vehicles, marine, rail traffic and aviation applications.

Drivers to electric and hybrid vehicle powertrains, requirements, technology (power electronics, electric machines, energy storages, mechanics), drive cycles, dimensioning and design.

Additional information

EN: Full-digi.
The course is related to UN's Sustainable Development Goals (SDG): 7 affortable and clean energy, 13 climate action, 15 life and land

Study materials

EN: Course material announced in Moodle.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 2. period, 1. period	4 cr
Course Completion		4 cr

BH10A1900 Fundamentals of Energy Technology

BH10A1900 Fundamentals of Energy Technology

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	2 cr
Languages	English
Grading scale	Pass-Fail
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LES, Energy Technology 100%
Responsible persons	Minna Loikkanen, Administrative person Ahti Jaatinen-Värri, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: kokonaan verkossa / full digi

Learning outcomes

EN: Upon completion of the course a student 1. Understands the laws of thermodynamics and apply thermal properties, 2. understands the fundamentals of fluid mechanics and is able to solve typical problems, 3. Has understanding of the basics of heat transfer and is able to solve typical problems, 4. understands the different power generation technologies and is be able to calculate material and energy balances, and 5.
Independently study and follow progress of energy technology.
Completion of the course supports the development of the following generic competences for working life: know-how on own field, mathematics and natural sciences, practical application of theories, working independently,

Content

EN: Thermodynamics: basic concepts, thermodynamic properties, conservation equations, open system energy analysis, 1st and 2nd law of thermodynamics, thermodynamic cycles, Carnot efficiency, exergy.
Heat transfer: fundamentals, conduction, convection, heat exchangers, introduction to radiation.

Fluid Dynamics: hydrostatics, conservation of mass, linear momentum equation, Bernoulli equation, pipe flow.

Power plant engineering: Ideal and real Rankine cycles, gas turbine power cycle.

Bioenergy: Bioenergy in the world, biomass combustion, challenges in the biomass use, bioenergy in EU, future use of biomass.

Additional information

EN: The course is aimed for students who want to independently brush up their basic knowledge of subjects needed in Master';s studies.

Study materials

EN: Course materials in Moodle.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-Summer	2 cr
Course Completion		2 cr
Method 2	Recurrence 1: 1. period-Summer	2 cr
Course Completion		2 cr

BH40A0802 Fluid Machinery

BH40A0802 Fluid Machinery

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	4 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LES, Energy Technology 100%
Responsible persons	Aki Grönman, Responsible teacher Minna Loikkanen, Administrative person
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta

Prerequisites

EN: Fundamentals of Engineering Thermodynamics and Fluid Dynamics 1 attended or equivalent course experience.

Learning outcomes

EN: Upon completion of the course the students are able 1. To choose a right type of fluid machinery for each application 2. To calculate velocity triangles for different machines 3. To make a preliminary design for different fluid machinery 4. To understand principles of flow theories behind design methodologies. The course supports the learning of following work life expertise and skills: Mathematics and natural sciences, practical application of theories, working independently, problem solving, information retrieval, time management and prioritizing tasks, analytical thinking skills.

Content

EN: Axial and radial turbomachinery design, design of hydro turbines, design of wind turbines, fluid machinery operating maps, velocity triangles. The course is affiliated on the sustainability of energy systems and based on international scientific research. The course is related to P2X theme.

Additional information

EN: The course is related to SDG 7: affordable and clean energy.

Study materials

EN: Study material in Moodle. Dick (2015) Fundamentals of Turbomachines (e-book), Dixon ; Hall (2014) Fluid Mechanics and Thermodynamics of Turbomachinery (e-book), Schobeiri (2012) Turbomachinery Flow Physics and Dynamic Performance (e-book).

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	4 cr
Course Completion		4 cr

BH40A1560 Fundamentals of Computational Fluid Dynamics

BH40A1560 Fundamentals of Computational Fluid Dynamics

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	6 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LES, Energy Technology 100%
Responsible persons	Minna Loikkanen, Administrative person Marta Zocca, Responsible teacher
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta

Prerequisites

EN: BM20A5001 Principles of Technical Computing or equivalent knowledge.

Compulsory prerequisites

BH40A1401 Fluid Mechanics I

Equivalences to other studies

BH40A1700 Numerical Methods in Heat Transfer

Learning outcomes

EN: This course acquaints students with the basic procedures for conducting Computational Fluid Dynamics (CFD) simulations and with the key numerical methods in heat and mass transfer.
Students will acquire the necessary skill set to independently analyze a fluid dynamics problem, identify a suitable model and solution method, perform a computer-aided simulation, critically interpret the results, and troubleshoot bottlenecks.

A CFD software is used to design simple engineering flow problems.

Completion of the course supports the development of the following generic competences for working life: mathematics and natural sciences, practical application of theories, oral and visual communication, working independently, problem solving, time management, prioritizing tasks.

Content

EN: Conservation equations (mass, momentum, energy), basic flow models, introduction to the physics of turbulence and turbulence modelling. Formulation of discretised conservation equations based on the Finite Volume Method. Solution algorithm for steady and unsteady problems. Setting boundary conditions. Grid quality and different types of grids. Setting up steady and transient CFD simulations. Solution procedures and techniques for CFD simulations. Visualization techniques and post-processing of results. Verification and validation of CFD results.

Additional information

EN: SDGs: 4 quality education, 7 affordable and clean energy, 9 industry, innovation and infrastructure

Study materials

EN: - Lecture and exercise notes (Moodle)
- CFD simulation data (Moodle)

- Textbooks (see Literature below)

Literature

Greenshields, C.J., Weller, H.G., Notes on Computational Fluid Dynamics: General Principles, CFD Direct Limited, 2022. Reference textbook, html version freely accessible at https://doc.cfd.direct/notes/cfd-general-principles/

Ferziger, J.H., Peric, M., Street, R.L., Computational Methods for Fluid Dynamics, 4th ed., Springer, 2020. Additional textbook, available as ebook from LUT library.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	6 cr
Course Completion		6 cr

BH50A1200 Energy Systems Engineering

BH50A1200 Energy Systems Engineering

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	6 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LES, Energy Technology 100%
Responsible persons	Minna Loikkanen, Administrative person Esa Vakkilainen, Responsible teacher Juha Kaikko, Responsible teacher
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta

Prerequisites

EN: Understanding of basic thermodynamics.

Learning outcomes

EN: Upon completion of the course the student will be able to 1. describe different types of energy production processes, 2. utilize thermodynamics and heat and mass balances in the design of small scale energy systems, 3. use a “Systems Engineering” type approach to define the design values for energy production processes, 4. define small scale bioenergy production projects, 5. understand how plant requirements affect the planning and implementation phases of small energy systems, and 6. define economic constraints to small scale energy processes.
Completion of the course supports the development of the following generic competences for working life: practical application of theories, international work environment, working independently, problem solving, analytical thinking skills, and time management and prioritizing tasks.

Content

EN: History and fundamentals of thermodynamics and energy engineering. Modern problems of power plant engineering. Combined heat and power production, especially from biomass. Fundamentals of steam and gas turbines in energy production. Engineering design: heat and mass balances in the design of small scale energy systems. Systems engineering. Planning and implementation of energy systems. Economic optimization of energy system projects.

Additional information

EN: Contact teaching.
***
The course is related to UN's Sustainable Development Goals (SDG): 7 affordable and clean energy, 9 industry, innovation and infrastructure, 13 climate action.

Study materials

EN: Lecture notes.
Systems Engineering Fundamentals, Defense Acquisition University Press, 2001.

Goswami, D.Y. and Kreith, F. (eds.): Energy Conversion, 2nd ed., CRC Press, 2017.

Literature

Blanchard, B.S. and Fabrycky, W.J.: Systems Engineering and Analysis, 5th ed., Pearson, 2014.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	6 cr
Course Enrolment		0 cr
Course Assessment		6 cr

BH50A1300 Maintenance Management

BH50A1300 Maintenance Management

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	4 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LES, Energy Technology 100%

Responsible persons	Minna Loikkanen, Administrative person Juha Kaikko, Responsible teacher Esa Vakkilainen, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta

Learning outcomes

EN: Upon completion of the course the student will be able to 1. identify the terminology used in maintenance management, 2. explain failure models, 3. utilize the concepts of reliability and availability, 4. explain maintenance strategies, 5. use methods to assess and control maintenance, and 6. describe how maintenance management is organized in power industry.
Completion of the course supports the development of the following generic competences for working life: mathematics and natural sciences, practical application of theories, working independently, problem solving, written communication, and time management and prioritizing tasks.

Content

EN: Maintenance terminology and types. Engineering design: failure models, reliability and availability. Maintenance models. Maintenance objectives and strategy. Criticality analysis. Root cause failure analysis. Reliability centered maintenance. Maintenance execution assessment and control. Maintenance costs. Total productive maintenance. Maintenance in power industry.

Additional information

EN: Contact teaching.
***
The course is related to UN's Sustainable Development Goals (SDG): 7 affordable and clean energy, 9 industry, innovation and infrastructure.

Study materials

EN: Lecture notes.
Crespo Márquez, A.: The Maintenance Management Framework: Models and Methods for Complex Systems Maintenance, Springer-Verlag, 2007.

Literature

Dhillon, B.S.: Engineering Maintenance: A Modern Approach, CRC Press, 2002.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	4 cr
Course Enrolment		0 cr
Course Assessment		4 cr

BH50A1400 Steam Boilers

BH50A1400 Steam Boilers

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	6 cr
Languages	English
Grading scale	General scale, 0-5

University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LES, Energy Technology 100%
Responsible persons	Minna Loikkanen, Administrative person Esa Vakkilainen, Responsible teacher
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta

Prerequisites

EN: Recommended: BH50A1200 Energy Systems Engineering.

Recommended prerequisites

BH10A1900 Fundamentals of Energy Technology

Equivalences to other studies

BH50A0800 Steam Boilers

Learning outcomes

EN: Upon completion of the course the student will be able to 1. list typical biomass fuels and their properties, 2. understand the terminology used in maintenance management, 3. understand steam generation processes, especially from biomass, 4. describe the construction of steam boilers, 5. apply different types of steam boilers using different types of fuels, and 6. realize restrictions caused by corrosion, erosion and fouling.
Completion of the course supports the development of the following generic competences for working life: mathematics and natural sciences, practical application of theories, working independently, problem solving, and time management and prioritizing tasks.

Content

EN: Characteristics of fuels, especially of biofuels. Combustion and gasification. Types of steam boilers. Design of a steam boiler and its components. Energy balances. Sizing of heat transfer surfaces. Solving steam boiler problems by mathematical modelling and algorithmization. Operation and maintenance of boilers: corrosion, fouling, emissions.

Additional information

EN: Contact teaching
SDGs: 7 affordable and clean energy, 13 climate action.

Study materials

EN: Lecture notes. Teir, Sebastian: Steam Boiler Technology, 2nd ed. 2006.

Literature

Vakkilainen, Esa, Steam generation from Biomass, 2016. Elsevier

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	6 cr
Course Enrolment		0 cr
Course Assessment		6 cr

BH61A0600 Bioenergy

BH61A0600 Bioenergy

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	3 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LES, Energy Technology 100%
Responsible persons	Minna Loikkanen, Administrative person Tapio Ranta, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta

Learning outcomes

EN: Upon completion of the course the student will be able to understand the meaning of bioenergy, alternative biomass resources,supply methods, refining and end-user applications, describe the quality properties of solid biofuels and how they are measured and evaluated by using standards, and explain the meaning of sustainability in bioenergy systems.
Completion of the course supports the development of the following generic competences for working life: sustainable development, know-how on own field, knowledge of the history and development of own field, written communication, information retrieval, critical thinking skills

Content

EN: The role of bioenergy in the EU energy policy,incentive programmes and future plans. Raw-material sources of bioenergy, potential resources and current use. Biomass supply systems and logistics. Refined biofuel commodities, biogas and liquid biofuels. Biomass international trade. Quality properties of solid biofuels, quality measurement and standards. Sustainable bioenergy.

Additional information

EN: The course is related to UN's Sustainable Development Goals (SDG): affordable and clean energy, decent work and economic growth, industry, innovation and infrastructure, sustainable cities and communities, climate action, partnership for the goals.

Study materials

EN: Energy Visions 2050, VTT. 2009. Chapters 2, 4.4, 5.2- 5.4. Additional material will be announced later during lectures.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period	3 cr
Course Assessment		3 cr
Course Enrolment		0 cr
Method 2	Recurrence 1: 1. period	3 cr
Course Assessment		3 cr
Course Enrolment		0 cr

BH70A0200 Advanced Topics in Modelling of Energy Systems

BH70A0200 Advanced Topics in Modelling of Energy Systems

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	6 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LES, Energy Technology 100%
Responsible persons	Minna Loikkanen, Administrative person Jouni Ritvanen, Responsible teacher
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta

Prerequisites

EN: BH20A0451 Heat Transfer, BH40A1452 Fluid Dynamics II, basics of thermodynamics, or similar skills./Ed. 26.09.18/ml

Learning outcomes

EN: Upon completion of the course the student will be able to: 1. create stationary and time dependent mass, momentum and energy balances for various kinds of energy systems, 2. perform design tasks, utilize mathematical software in calculation, and analyze the characteristics of
energy systems, 3. include material property definitions into mathematical software or into own code when simulating energy systems, 4. create, solve and analyze the set of stationary and time dependent balance equations using Excel and MATLAB, 5. create, solve and analyze stationary energy systems with IPSEpro software package, and 6. create, solve and analyze time dependent energy systems with APROS software package.
Completion of the course supports the development of the following generic competences for working life: Know-how on own field, Knowledge of the research of own field, Mathematics and natural sciences, Practical application of theories, Written communication, Oral communication, Digitalisation and utilisation of data, Leadership skills, Team working skills, Working independently, Problem solving, Information retrieval, Project management, Time management and prioritizing tasks, Developing own skills in working life, Critical thinking skills, Analytical thinking skills.

Content

EN: Model and simulate thermal and fluid flow components such as pumps, fans, compressors, turbines, heat exchangers and reactors. Model, simulate and analyze energy processes.
Advanced problems in the modelling of energy systems needed by engineers and researchers. The course lectures provide mathematical basis for problem formulation, and exercises providing a chance to work with various computational packages.

Additional information

EN: Contact teaching
***

The course is related to UN's Sustainable Development Goals (SDG): 7 affortable and clean energy

Study materials

EN: Moodle.

Literature

Incropera's principles of heat and mass transfer by Bergman et al
Fundamentals of Engineering Thermodynamics by Moran and Shapiro
Fluid mechanics by White

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	6 cr
Course Completion		6 cr

BH50A0301 Power Plant Design

BH50A0301 Power Plant Design

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	6 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LES, Energy Technology 100%
Responsible persons	Minna Loikkanen, Administrative person Juha Kaikko, Responsible teacher Esa Vakkilainen, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta

Prerequisites

EN: BH50A0200 Introduction to Power Plant Engineering attended.

Learning outcomes

EN: Upon completion of the course the students will be able to 1. explain the advanced processes of thermal power plants (excl. nuclear energy), 2. describe the methods used for the reduction of emissions related to energy production, 3. estimate the impact of power plant control on the utilization economy and usability, 4. apply thermodynamics and mass and energy balances to improve the efficiency and the operation of the energy processes, 5. design power plant processes for the production of electricity and heat and select the appropriate auxiliary equipment, and 6. describe the phases in the implementation of power plant projects.
Completion of the course supports the development of the following generic competences for working life: mathematics and natural sciences, practical application of theories, working independently, problem solving, and time management and prioritizing tasks.

Content

EN: Special features of different power plant types. Engineering design: planning and design of power plants and distributed energy systems, simulation and modelling. Implementation of power plant projects. Utilisation and control of power plants, emission reduction. Future energy systems.

Additional information

EN: Contact teaching.

***
The course is related to UN's Sustainable Development Goals (SDG): 7 affordable and clean energy, 9 industry, innovation and infrastructure, 13 climate action.

Study materials

EN: Lecture notes.

Literature

Sarkar, D. K.: Thermal Power Plant: Design and Operation, Elsevier, 2015

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	6 cr
Course Enrolment		0 cr
Course Assessment		6 cr

BH60A0252 Solid Waste Management Technology

BH60A0252 Solid Waste Management Technology

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	7 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LES, Environmental Technology 100%
Responsible persons	Mika Horttanainen, Responsible teacher Annukka Ilves, Administrative person Miro Lilja, Responsible teacher
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta, Lahti

Prerequisites

EN: Recommended: BH60A0001 Ympäristötekniikan perusteet, BH60A0902 Ympäristöluvat ja -mittaukset or equivalent knowledge

Learning outcomes

EN: Upon completion of the course the student is expected to be able to
1. explain the most important generation mechanisms, properties, and collection and treatment systems of solid waste,
2. explain the operation of essential process technology and equipment,
3. compare and give grounded proposals for treatment methods and processes applicable to different situations,
4. calculate process parameters related to composting, digestion and energy utilization,
5. apply waste management legislation,
6. apply what he/she has learned to the environmental treatment and utilization of waste, and
7. describe the operation of regional waste management.

Content

EN: Generation of solid waste and waste management in different parts of the world, properties of waste, legislation concerning waste management, source separation, collection and transport, pretreatment, composting, anaerobic digestion, waste-to-energy, landfilling, regional waste management, treatment of polluted soil.

Additional information

EN: Note

The lectures and exercises are given in Lappeenranta, but there will be couple of intensive learning days arranged in Lahti if there is need for that. These dates will be informed after the start of the course. The course can be studied also as distance learning. The lectures will be recorded and available in Moodle.

Study materials

EN: Tchobanoglous, Theisen, Vigil: Integrated Solid Waste Management, 1993._x000D_
Handouts provided by the lecturer, course environment in Moodle. Recorded lectures in Moodle. Exercises in Moodle.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	7 cr
Course Completion		7 cr

BH60A0451 Air Pollution Control

BH60A0451 Air Pollution Control

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	6 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LES, Environmental Technology 100%
Responsible persons	Risto Soukka, Responsible teacher Annukka Ilves, Administrative person Jani Sillman, Responsible teacher
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta

Learning outcomes

EN: Upon completion of the course the student is expected to be able to
1. comprehend the air pollution control terminology,
2. apply methods for improving air quality in cities,
3. apply methods for decreasing the carbon footprint of products and services,
4. control air pollution treatment methods economically in changing conditions,
5. calculate reduction costs for air pollution,
6. apply different risk assessment methods,

7. comprehend the formation and treatment methods of air pollution,
8. comprehend air pollution control technologies and processing systems, and
9. comprehend sustainability aspect of air pollution control

Content

EN: Control of particulates, sulphur and nitrogen oxides, greenhouse gas emissions, and of other gaseous emissions. Risk assessment methods. Sustainability aspects.

Additional information

EN: In MSc programme in Circular Economy the course is recommended to take in second year of studies

Study materials

EN: De Nevers Noel: Air Pollution Control Engineering, Cooper: Air Pollution Control - A DesignApproach. Moodle.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	6 cr
Course Completion		6 cr

BH60A4402 Sustainability in Socio-Technological context

BH60A4402 Sustainability in Socio-Technological context

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	6 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LES, Environmental Technology 100%
Responsible persons	Annukka Ilves, Administrative person Jarkko Levänen, Responsible teacher Miika Marttila, Responsible teacher Lassi Linnanen, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta

Equivalences (free text field)

EN: BH60A4400 Introduction to Sustainability

Learning outcomes

EN: After successfully completing the course, students are able to:
1) Outline the different dimensions of sustainability; ecological, social, economic and cultural,

2) Explain the interaction between the environment, society and business and the relationships, of various actors in these fields and their impacts on the society and the environment ,

3) Explain the core idea and thinking behind sustainability and its importance in order to limit or decelerate environmental damages and improve our quality of life while pursuing a more sustainable lifestyle and business within the planetary boundaries,

4) Apply practically the learned principles and concepts of sustainability in relation to current production and consumption habits,

5) Analyze environmental impacts of a product within a selected system,

6) Know and be able to apply different value-adding activities and tools that promote sustainability; and

7) Reflect on sustainability principles and desirably in thinking and lifestyles.

Content

EN: The general objective of the course is to provide a comprehensive overview on the concepts of sustainability, sustainable business, and sustainable transition. The course introduces global sustainability challenges that the planet and societies are facing due to human activities and natural causes. Sustainability challenges and their interconnections are learnt and understood in order to realize the need for the sustainability transition.

Additional information

EN: The course is based on independent digitalized studying supported by two lectures during the period 1.

Study materials

EN: Will be announced in Moodle.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period	6 cr
Course Completion		6 cr

BH60A6300 Energy Efficient Environment 1

BH60A6300 Energy Efficient Environment 1

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	3 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LES, Environmental Technology 100%
Responsible persons	Mika Luoranen, Responsible teacher Annukka Ilves, Administrative person
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta

Prerequisites

EN: Basic understanding of thermodynamics.

Equivalences to other studies

BH60A2701 Energy Efficient Environment

Learning outcomes

EN: Upon completion of the course the student is expected to be able to:
1. recognize interactions between energy consumption in buildings and in areas.
2. recognize means for improving energy efficiency in buildings and areas.
3. recognize methods for assessing energy efficiency of areas.

Content

EN: Lectures deal with the following topic areas: areal planning, legal and economic control factors, planning of areal energy consumption, low energy buildings, areal energy supply and environmental performance criteria.

Additional information

EN: Hybrid teaching

Study materials

EN: Lecture material, Moodle.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	3 cr
Course Completion		3 cr

BH60L3000 Biological Cycle in Circular Economy

BH60L3000 Biological Cycle in Circular Economy

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	6 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LES, Environmental Technology 100%
Responsible persons	Jouni Havukainen, Responsible teacher Annukka Ilves, Administrative person Musharof Khan, Responsible teacher
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lahti

Learning outcomes

EN: Upon completion of the course the student is expected to be able to
1. recognize the most significant sources for biogenic byproducts
2. comprehend the potential of biomaterials in tackling sustainability challenges
3. understand principles of technologies suitable for valorizing biogenic byproducts
4. comprehend potential production chains for valorizing biogenic byproducts
5. apply skills to support product design for recyclability

Content

EN: Design challenges for biobased products, main contributors for biogenic byproducts, biofuel production technologies and chains, role of biomaterials in sustainability, biological treatment technologies.

Additional information

EN: The course is intented to students of Envinronmental Technology and Industrial Management, especially Circular Economy minor students.

Study materials

EN: Coursematerials will be delivered via Moodle.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	6 cr
Course Completion		6 cr

BH60L4000 Technical Cycle in Circular Economy

BH60L4000 Technical Cycle in Circular Economy

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	6 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LES, Environmental Technology 100%
Responsible persons	Kaisa Grönman, Responsible teacher Annukka Ilves, Administrative person
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Online/partially hybrid from Lahti campus

Prerequisites

EN: Recommended: BH60A5400 Introduction to Circular Economy

Learning outcomes

EN: After completing the course, the student is able to:
1) apply life cycle thinking in the design and optimization of the techno-cycle of products;
2) understand how circular economy principles can be connected in techno-cycle
of products to manage the sustainability challenges;
3) apply circular economy principles in systematic material selection by understanding also the possibilities of 6 R's (reduce, rethink, refuse, recycle, reuse, repair);
4) identify the enablers and drivers of sustainable business around product design; and
5) rethink products, services, underlying processes and business models in viewpoints of different actors in the value chain and product life cycle.

6) co-operate with students and company representatives of different backgrounds, nationalities and disciplines

Content

EN: 1. Circular economy especially from product and process design point of view
2. Sustainable production process focusing on material selection, product design and related production methods
3. Integrating circular economy into sustainable business models
4. Value chain optimization
5. Quantitative sustainability assessment methods for supporting decision making and development of sustainable technology with regard to circular product design and optimization
6. Co-creating case studies with industry based on their actual real-life challenges, such as selecting raw materials, production technologies, optimizing life time of a product, optimizing environmental impacts and increasing circularity.

Additional information

EN: The course is intended to students of Environmental Technology and Industrial Management, especially Circular Economy major and minor students.
The course is related to UN's Sustainable Development Goals (SDG): 9 industry, innovation and infrastructure, 12 responsible consumption and production, 13 climate action

Study materials

EN: Lecture slides and video materials. Recommended reading materials.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	6 cr
Course Completion		6 cr

CS10A0864 Research Methods in Management

CS10A0864 Research Methods in Management

Abbreviation: RM

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	6 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Industrial Engineering and Management 100%
Responsible persons	Armi Rissanen, Administrative person Yan Xin, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta

Prerequisites

EN: No prerequisites

Learning outcomes

EN: Upon completion of the course, the students will gain understating of the research process and will be able to
- conduct independent scientific and applied research in management and report the research results

- define research objectives and formulate research questions

- search and analyze literature and conduct a literature review

- understand research philosophies and approaches

- formulate research design and make a justified choice of research methods

- collect and analyze qualitative and quantitative data

- interpret and report the results of the research

Content

EN: The course aims to provide methodological support and clear guidelines to master students on how to conduct research in management and how to report its results. The course consists of lectures and seminars. Topics include but not limited to formulating and clarifying the research topics, reviewing the literature, understanding research philosophies and approaches, formulating research design and choosing research methods, collecting and analyzing quantitative and qualitative data, and writing research reports and presenting the results.
Research reports, seminar presentations, quizzes, and individual learning diaries are essential parts of course evaluation.

Additional information

EN: Amount of participants max. 50. Priority is given to the students of M.Sc. programme GMIT.
***

The course is related to UN's Sustainable Development Goals (SDG): 4 quality education, 8 decent work and economic growth, 11 sustainable cities and communities

Study materials

EN: Saunders, M., Lewis, P. and Thornhill, A. (2019). Research methods for business students, 8th ed. Harlow, Essex: Pearson Education.
Lecture slides and additional materials in Moodle.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	6 cr
Course Completion		6 cr

CS30A1342 Technology and Innovation Management: project course

CS30A1342 Technology and Innovation Management: project course

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	6 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Industrial Engineering and Management 100%

Responsible persons	Ville Ojanen, Responsible teacher Armi Rissanen, Administrative person Kalle Elfvengren, Responsible teacher Gülfem Özmen, Responsible teacher
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta

Prerequisites

EN: Basic knowledge on innovation and technology management (e.g. Bachelor in industrial engineering and management or Technology and innovation management: Introductory course).

Learning outcomes

EN: To develop in-depth understanding in focused innovation and technology management areas
To analyze, develop and plan alternative solutions for managing technology, innovations, as well as product and service portfolios in organizations

To apply relevant tools and frameworks of technology and innovation management to real-world problems in collaborative working environment

Content

EN: Processes, methods and tools of innovation and technology management: Strategic analysis methods, future studies, idea generation, concept development, decision-making support for innovation process, Quality Function Deployment, design for business model innovations. Varying contemporary themes, e.g. circularity, twin transformation, ethics in technology management.

Additional information

EN: The course is related to UN's Sustainable Development Goals (SDG):
4 quality education

8 decent work and economic growth

9 industry, innovation and infrastructure

17 partnership for the goals

Study materials

EN: Joe Tidd and John Bessant. Managing Innovation – Integrating Technological, Market and Organizational Change, 7th ed. (2020), (including e-learning material), or previous editions. Lecture notes and other material announced in the beginning of the course.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	6 cr
Course Completion		6 cr
Method 2	Recurrence 1: 1. period-2. period	6 cr
Course Completion		6 cr

CS34A0551 Business Idea Development

CS34A0551 Business Idea Development

Curriculum period	2024-2025

Validity period	since 1 Aug 2024
Credits	6 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Industrial Engineering and Management 100%
Responsible persons	Armi Rissanen, Administrative person Suvi Konsti-Laakso, Responsible teacher
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lahti

Learning outcomes

EN: In this course, business idea development is explored from theoretical viewpoint as well as from practical viewpoint. Student can explain and analyze key theoretical approaches associated to business idea development. The student learns to identify, develop and assess future-oriented business opportunities and ideas. The student can use different systematical tools and techniques related to business idea development.

Content

EN: Entrepreneurial process, opportunity theories, opportunity sources. Entrepreneurial innovation, innovativeness and creativity. Systematic idea generation and idea generation techniques.

Additional information

EN: The course is related to UNs Sustainable Development Goals (SDG) 9 industry, innovation and infrastructure.

Study materials

EN: Study materials will be articles, lecture slides, videos and reports. They will be available in Moodle.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 2. period	6 cr
Course Completion		6 cr
Method 2	Recurrence 1: 2. period	6 cr
Course Completion		6 cr

CS30A1620 Artificial Inventiveness

CS30A1620 Artificial Inventiveness

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	1 cr
Languages	English
Grading scale	Pass-Fail
University	Lappeenranta-Lahti University of Technology LUT

Responsible organisation	LENS, Industrial Engineering and Management 100%
Responsible persons	Leonid Chechurin, Responsible teacher Anastasia Chakir, Responsible teacher Armi Rissanen, Administrative person
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Full digi / 100 % verkossa

Equivalences to other studies

CS30A1641 Inventive Product Design and Advanced TRIZ

or

CS30A7390SS Inventive Product Design and Advanced TRIZ

or

CS30A7380SS Systematic Creativity - TRIZ Basics

or

CS30A7381SS Systematic Creativity - TRIZ Basics Online

or

CS30A7391SS Inventive Product Design and Advanced TRIZ Online

Learning outcomes

EN: Upon successful completion of the course the learner is expected to be able to:

- Identify inventive problems in the complex process of product development
- Apply several tools for systematic idea generation (Function modelling, Ideal final result, Function-oriented search, Contradictions analysis)
- Act step-by-step when creative and out-of-box ideas are needed

Content

EN: It is an online course for all interested in creativity, in systematic tools of ideation. The modules contain basic TRIZ (Theory for Inventive Problem Solving) tools for idea generation.
Have you ever thought why it is hard to find a new idea sometimes? How to analyze the situation where you need an out of box solution? How to deliver systematically the list of concepts to improve a product or a service?

This self-paced course includes the following modules:

1. Introduction
2. Function Definition
3. Ideal Final Result
4. Function-oriented Search
5. Contradictions

This course is a brief introduction to creativity and idea generation with elements of theory, everyday life examples and tests for self-check. If you want to dive deeper into TRIZ and tools for idea generation, we would be happy to invite you to instructor-paced Inventive Product Design and Advanced TRIZ course.

Study materials

EN: Course videos are available on CEPHEI platform (remember to submit your certificate in Moodle)

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-SummerSummer	1 cr
Course Completion		1 cr

CS30A0010 Technology and innovation management: introductory course

CS30A0010 Technology and innovation management: introductory course

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	3 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Industrial Engineering and Management 100%
Responsible persons	Ville Ojanen, Responsible teacher Armi Rissanen, Administrative person Gülfem Özmen, Responsible teacher
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta

Equivalences (free text field)

EN: Not allowed to include in the same degree as CS30A1341 Strategic Technology and Innovation Management (which was provided last time in 2021-22).

Learning outcomes

EN: Student will be able to

- identify and understand the main innovation and technology management concepts and their linkages to innovation process, innovation and technology strategy and innovative organization
- analyze and design technology and innovation strategy of a company
- analyze the usability of various methods of innovation and technology management

Content

EN: Innovation as a core business process. Innovative organisation. Development of technology and innovation strategy. Innovation networks. Decision-making in technological and market uncertainty. Creation of new products and services. Innovation performance and learning. Sustainability and innovation.

Additional information

EN: The course is related to UN's Sustainable Development Goals (SDG):
4 quality education

8 decent work and economic growth

9 industry, innovation and infrastructure

Study materials

EN: Joe Tidd and John Bessant. Managing Innovation – Integrating Technological, Market and Organizational Change, 7th ed. (2020), (including e-learning material), or previous editions. Online material.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period	3 cr
Course Completion		3 cr
Method 2	Recurrence 1: 1. period	3 cr
Course Completion		3 cr

CT80A0000 Data-Intensive Systems

CT80A0000 Data-Intensive Systems

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	6 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Software Engineering 100%
Responsible persons	Jonna Naukkarinen, Administrative person Jiri Musto, Responsible teacher
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs)

Tweet text

EN: Location: Lappeenranta

Prerequisites

EN: Recommended: Web Applications or equivalent, Distributed Systems or equivalent,Introduction to Databases or equivalent.
Required: CT60A4320 - Intro to database

For Master's students only

Compulsory prerequisites

CT60A4304 Basics of database systems

or

CT30A3401 Distributed Systems

or

CT60A0203 Fundamentals of Programming

Learning outcomes

EN: At the end of the course students are able to:

1. Analyze and identify the main challenges of complex distributed data-intensive software systems such as e-commerce platforms eg. Amazon.
2. Apply concepts and principles of distributed databases systems.
3. Design a distributed, scalable, and reliably performing data-intensive systems such as e-commerce platforms eg. Amazon.
4. Develop a prototype of a distributed, scalable, and reliably performing data-intensive system.
5. Demonstrate the ability to work in a team to realize a working design.
6. Demonstrate professional communication skills through project presentation and reporting.

Content

EN: Introduction to distributed database systems, distributed database applications, databases systems and internet, distributed data storage and retrieval,
data scalability, performance, data warehousing and data mining from the perspective of value creation and communication in distributed systems,
advanced topics in databases such as security, authorization, modeling and programing for semi-structured data, secondary storage management, query execution, cloud computing.

Additional information

EN: The course is related to UN's Sustainable Development Goals (SDG):
9 industry, innovation and infrastructure

Study materials

EN: 1) M. Tamer Özsu, Patrick Valduriez, Principals of Distributed Database Management Systems. 3rd Edition, Springer ISBN 978-1-4419-8833-1
2) Hector Garcia-Molina, Jeffrey D. Ullman and Jennifer Widom: Database Systems :The Complete Book, Pearson Prentice Hall 2nd Edition, 2009

3)Tanenbaum and M. Van Steen: Distributed Systems, Principles and paradigms, Pearson Education 2007

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	6 cr
Course Completion		6 cr

CS30A1372 Creative Design and Problem Solving

CS30A1372 Creative Design and Problem Solving

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	6 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Industrial Engineering and Management 100%
Responsible persons	Armi Rissanen, Administrative person Andrzej Kraslawski, Responsible teacher
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta

Prerequisites

EN: Basic courses of management. Basic knowledge of engineering disciplines, e.g. mechanical electrical, chemical.

Learning outcomes

EN: Learning outcomes: After fulfilling all requirements of the course, the students will be able to: 1. Understand the principles of creative problem solving 2. Know the basic methods of creative design 3. Work

in team during the design process 4. Apply methods of creative design to products, processes, services and business methods

Content

EN: The major subjects of the course are: Critical Reasoning: - Socratic Questions, - Dunker Diagram, - Kepner-Tregore Method; Major Steps in Problem Solving; Types of Problems; Survey of Intuitive and Structured Methods of Creativity Enhancement: - Brainstorming, - Checklists, - Morphological Analysis, - Case-based Reasoning, - TRIZ; Selection of Ideas

Study materials

EN: Course slides.Tony ProctorCreative problem solving for managers Routledge, 3rd edition, 2009H. Scott Fogler and Steven E. LeBlancStrategies for Creative Problem SolvingPrentice Hall, 3rd edition , 2013David Silverstein, Philip Samuel, Neil DeCarloThe Innovator's Toolkit: 50+ Techniques for Predictable and Sustainable Organic GrowthWiley, 2009Alexander Osterwalder and Yves PigneurBusiness Model GenerationOsterwalder and Pigneur, 2010

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	6 cr
Course Assessment		6 cr
Course Enrolment		0 cr
Method 2	Recurrence 1: 1. period-2. period	6 cr
Course Assessment		6 cr
Course Enrolment		0 cr

CS39A0220 Accessibility design and management for people with disabilities

CS39A0220 Accessibility design and management for people with disabilities

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	3 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Industrial Engineering and Management 100%
Responsible persons	Armi Rissanen, Administrative person Lobna Hassan, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Learning outcomes

EN: The aim in this course is to
1. Draw on disability studies and introduce the students to what disability is (visual, auditory, motor, mobility, and cognitive disability as well as neurodiversity) and how it impacts the life of each disability group

2. Develop the students' capacities in how to work with people with disabilities

3. Introduce the students to some of the common approaches to accessibility and universal design

4. Develop the student’s capacity to critically reflect on society and social practices when it comes to inclusion and disability.

Content

EN: Approximately 1 billion people in the world live with some form of disability. This number is only expected to grow due to factors such as aging, natural disasters, and wars. While the term "disability" can be controversial, it's important to acknowledge that no one has perfect abilities or senses all the time. Neurodiversity and emotional disabilities, such as depression and ADHD, also affect a significant portion of society. Disability affects people differently, but it is a common experience that many of us face to varying degrees. It is crucial to understand disability, how to interact with people who have it, and how to promote inclusiveness.
Technology is deeply ingrained in our society, affecting nearly every aspect of our lives, from banking to healthcare. However, technology is not always accessible to people with disabilities. Touch screens can be challenging for those with motor disabilities, some offices are not equipped for wheelchairs, and information systems can be inaccessible to those with low vision. It is important to ensure that people with disabilities have equal access to technology and are included in society as citizens, employees, entrepreneurs, and caregivers.

The concept of accessibility, universal design, and design for all refers to designing technology in a way that is usable with minimal effort. Ensuring accessibility is both a moral obligation and an opportunity to improve design practices. The purpose of this course is to educate students on disability, how it impacts different groups, how to interact with people with disabilities, common approaches to accessibility, and to encourage critical reflection on society's practices surrounding inclusion and disability.

Additional information

EN: This course is related to UN's SDG goals 3 good health and wellbeing, 10 reduced inequalities 10 reduced inequalities, 11 sustainable cities and communities, 12 responsible consumption and production, and 16 peace, justice, and strong institutions

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 2. period	3 cr
Course Completion		3 cr

CS30A0810 Must-Have Math for Decision Makers

CS30A0810 Must-Have Math for Decision Makers

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	3 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Industrial Engineering and Management 100%
Responsible persons	Armi Rissanen, Administrative person Leonid Chechurin, Responsible teacher Viktor Dodonov, Responsible teacher Anna Kruzenshtern, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Moodle

Learning outcomes

EN: After completing the course, students will be able to:

- perform basic operations over mathematical objects and operators: matrix, polynomial, derivative, integral, equation/inequation, differential equations, mean/variance, regression, etc.
- know basic optimization strategies
- code/operate the above mentioned in MATLAB and/or Python

Content

EN: Basics of linear algebra, probability theory, functional series, Laplace transform, differential equations, stability and optimization, programming in MATLAB-Simulink and Python

Study materials

EN: Course materials are given in Moodle together with lectures, quizzes, assignments, additional materials.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-4. period	3 cr
Participation in teaching		3 cr

CS30A0820 The Dark Side of Sustainability

CS30A0820 The Dark Side of Sustainability

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	3 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Industrial Engineering and Management 100%
Responsible persons	Armi Rissanen, Administrative person Deniz Turkcu, Responsible teacher Nina Tura, Responsible teacher
Study level	Other studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Learning outcomes

EN: The aim of the course is to familiarize students with the discussions on the negative consequences of sustainability initiatives. Through its content, the course aims to enhance students' comprehension of how efforts towards sustainability within both corporate and governmental spheres can inadvertently lead to unwanted outcomes. Despite often being depicted as mutually beneficial solutions for addressing sustainability challenges, these efforts may contribute to environmental, social, and economic harm within organizations and systems and impede broader transitions towards sustainability. After taking the course, students should be able to:
-Gain insight into how sustainability efforts can result in unsustainable outcomes

-Acquire skills to critically evaluate sustainability initiatives

-Develop strategies to address potential negative consequences of sustainability efforts

- Learn key concepts and academic theories related to the “dark side of sustainability” topics

- Apply learned concepts and theories to real-life case studies across various sectors, facilitating practical understanding and application

Content

EN: Main aim of the course is to help students learn and understand the unintended negative consequences of sustainability initiatives and familiarize students with the emerging concepts and frameworks related to the dark side of sustainability literature. Students will learn to analyze the actions of different actors that may result in the mentioned unintended consequences as well as how to prevent and mitigate them. The course aims to enhance the development of students' critical thinking, collaboration, communication, reporting, strategic action, case study analysis and systems thinking skills to be used in future decision-making.

Additional information

EN: The course is related to UN's Sustainable Development Goals (SDGs): 12 Responsible Consumption and Production, 13 Climate Action, 9 Industry, Innovation and Infrastructure, 11 Sustainable Cities and Communities, 8 Decent work and Economic Growth, 10 Reduce Inequality within and among Countries

Study materials

EN: Case studies, academic articles, reports, videos and online lectures

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period	3 cr
Participation in teaching		3 cr

BK10A3800 Principles of Industrial Manufacturing Processes

BK10A3800 Principles of Industrial Manufacturing Processes

Abbreviation: PoIMP

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	5 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LES, Mechanical Engineering 100%
Responsible persons	Annukka Ilves, Administrative person Sami Matthews, Responsible teacher Juha Varis, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta and Lahti

Learning outcomes

EN: Students should be able to identify the principles of machining products, sheet metal production, additive manufacturing, common welding processes, and packaging processes after completing this course module.

In this course, students learn to describe the characteristics that describe the manufacturability of various materials and measures of quality, as well as aspects of efficient use of natural resources, sustainable production, and manufacturing.

Students will also be able to seek out scientific information, evaluate it critically, and use it in their own writing in addition to writing technical and scientific reports.

Content

EN: The course examines on the most common industrial processes in manufacturing technology and ways to improve the sustainability of products through manufacturing. In addition, aspects of production management are considered.

The course includes reverse engineering task for a group work.

Study materials

EN: Course material is available in the Moodle.

Literature

Manufacturing Processes for Engineering Materials (2016, 6th Edition) by Serope Kalpakjian

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	5 cr
Course Completion		5 cr
Method 2	Recurrence 1: 1. period-2. period	5 cr
Course Completion		5 cr

BK10A3900 Reliability Based Machine Element Design

BK10A3900 Reliability Based Machine Element Design

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	5 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LES, Mechanical Engineering 100%
Responsible persons	Annukka Ilves, Administrative person Changyang Li, Responsible teacher Humberto Almeida Junior, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta

Prerequisites

EN: B.Sc. (Mech.Eng.) Degree or equivalent knowledge.

Learning outcomes

EN: After successfully completing this course, the student will be able to:
- utilize different reliability based measures for machine element design as well as manufacturing
- apply tools and techniques for risk analysis of a machine or mechanical system
- compare materials and manufacturing processes for reliable machine elements
- use principles, with which the designer can improve the product to reduce the failure probability
- apply failure mode analysis, especially in context of wear and corrosion phenomena

- choose an appropriate distribution to analyze reliability aspects of a component

Content

EN: The course will cover the following topics:
- The importance of multidisciplinary optimization including reliabilioty based constraints in design is discussed
- Tools and techniques for both qualitative and quantitative risk analysis of an assembly or a technical system are presented.
- Aspects, how uncertainties associated with statistical distributions and any insufficient information may lead to large errors in probability calculations in engineering are clarified.
- Analytical tools for analyzing failure modes of machine elements, machines and technical systems are taught.
- Guidelines to choose an appropriate distribution to analyze reliability aspects and lifetime of a component are presented.

Additional information

EN: Blended learning

Study materials

EN: Lecture notes and other learning materials to be provided during the course on Moodle
Birolini, Alessandro. Reliability engineering. Vol. 5. Berlin: Springer, 2007.

Literature

Birolini, Alessandro. Reliability engineering. Vol. 5. Berlin: Springer, 2007.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	5 cr
Course Completion		5 cr
Method 2	Recurrence 1: 1. period-2. period	5 cr
Course Completion		5 cr

BK60A1700 Control and Design of Robot Systems

BK60A1700 Control and Design of Robot Systems

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	5 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LES, Mechanical Engineering 100%
Responsible persons	Ming Li, Responsible teacher Annukka Ilves, Administrative person Huapeng Wu, Responsible teacher
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta

Prerequisites

EN: The course is designed for postgraduate (M.Sc.) students, who have the background in mechanical or electrical engineering studies. This is an advanced course following the topics introduced in the course BK10A6600 Robotics.
The students should have the knowledge of mechatronic system design, understand the mechanisms and machine theory. Regarding the mathematics, the students should have learnt the Linear Algebra and had the comprehensive understandings on vector space and linear transformation. The student should have the knowledge of constructing and solving the differential equations. The student should have the concept of close loop control system and programming skills, and we will use the Matlab for the computation and the MATLAB. Simulink for the robotic system simulation in the course.

Learning outcomes

EN: In this course, the students will obtain the knowledge and skills in the area as follows:
1. Being able to compute the kinematics, static and dynamics of a generic robotic system.

2. Being able to write codes in Matlab and Simulink for calculations related to robotic system.

2. Being able to design a proper robotic system for applications.

3. Being able to simulate the robotic system to verify the design.

Through this course, you will learn all the necessary knowledge to design and simulate a robotic system for applications.

Content

EN: The course consists of lectures, exercises (home assignments), simulation tutorials and independent robotic system design project.
The content in this course can be generally categorized as follows (in 6 general topics):

1. Robotics introduction.

Under this topic, we will introduce what a robot is, morphology of robot, and the composition of a generic robotic system, where you learn the components of a robotic system.

2. Kinematics of robots

Under this topic, the DOF, Workspace, will be briefly explained. The DH parameters, forward kinematics and inverse kinematics of serial and parallel robot will be briefly introduced. The Jacobian analysis of robotic system will be elaborated.

3. Matlab coding practice

The teaching of this content will be implemented intersecting with lectures in topic 2. How the kinematics calculation can be implemented through Matlab coding will be demonstrated, as well as the exercise solutions in Matlab.

4. Motion planning of robotics

The trajectory planning of serial and parallel robot will be elaborated.

5. Statics and dynamics of robotics

The statics and dynamics modeling of robotic system will be introduced.

6. Simulation

A robotic system will be established in the Matlab.Simulink and a standard 6DOF industrial robot with close loop position control will be demonstrated in the simulation.

Additional information

EN:
***The course is related to UN's Sustainable Development Goals (SDG):
Goal 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

Goal 5. Achieve gender equality and empower all women and girls

Goal 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

Study materials

EN: 1. Lecture notes.
2. Exercises.

2. Simulation tutorials.

Literature

Robot Analysis: The Mechanics of Serial and Parallel Manipulators, Lung-Wen Tsai;
Introduction to Robotics: Mechanics and Control, 3rd Edition, John J. Craig;
https://se.mathworks.com/products/simscape-multibody.html

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	5 cr
Course Completion		5 cr
Method 2	Recurrence 1: 1. period-2. period	5 cr
Course Completion		5 cr

BK70A0001 Simulation of a Mechatronic Machine

BK70A0001 Simulation of a Mechatronic Machine

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	5 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LES, Mechanical Engineering 100%
Responsible persons	Annukka Ilves, Administrative person Aki Mikkola, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta, kokonaan verkossa / full digi

Prerequisites

EN: Students are recommended to have completed BK80A2600 Mekaniikka and BK60A0200 Mekatroniikka.

Equivalences to other studies

BK10A3101 Simulation of a Mechatronic Machine JEDI

Learning outcomes

EN: The student possesses the theories and practices of mathematical modeling and computer simulation of machine systems, which are hydraulically actuated. The student is able to utilize simulations as an integrated tool of product design and he/she can utilize his/her skills to generalize the theories of engineering design to solve multidisciplinary design tasks and real-life problems. The student is able to compare and justify the use of different constructional solutions for linear and rotating motion mechanism based on their static, kinematic and dynamic analysis. The student is able to individual scientific work to simulate mechatronic machines.

Content

EN: Principles of multibody dynamics, modelling of actuators, coupled simulation. Use of the concept of virtual work. Constraint equations and Lagrangian multipliers. Inertia of rigid bodies. Modelling of hydraulic components. Numerical integration of the equation of motion.
Individual utilisation of simulation software, including the principles of how to apply previously mentioned mathematical theories to handling and solving abstract and multidisciplinary problems.
The course module supports the following UN Sustainable Development Goals: #9 Industry, Innovation and Infrastructure.

Study materials

EN: Lecture notes.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	5 cr
Course Assessment		5 cr
Course Enrolment		0 cr
Method 2		5 cr
Course Enrolment		0 cr
Course Assessment, mid-term		5 cr
Method 3	Recurrence 1: 1. period-2. period	5 cr
Course Assessment		5 cr
Course Enrolment		0 cr
Method 4		5 cr
Course Enrolment		0 cr
Course Assessment, mid-term		5 cr

BK80A3000 Integrated Design and Fabrication of Welded Structures

BK80A3000 Integrated Design and Fabrication of Welded Structures

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	5 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LES, Mechanical Engineering 100%
Responsible persons	Annukka Ilves, Administrative person Masoud Moshtaghi, Responsible teacher Jani Riski, Responsible teacher
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta

Prerequisites

EN: BK80A2303 Steel Structures II or BK20A2500 Sustainable Welding Production completed.

Compulsory prerequisites

BK80A2303 Steel Structures II

Recommended prerequisites

BK80A3400 Design of Advanced Plate and Shell Structures

BK80A1302 Applications for FE-method for Steel Structures

Learning outcomes

EN: By the end of the course, students will be able to
- apply learned theoretical skills comprehensively learned from the previous Steel Structure courses for designing and planning production for welded structures or complete member of such structure
- apply theoretical knowledge for practical design and fabrication of welded structure
- collect design data and use design tools to create a competitive and fabrication-friendly construction based on requirements set by end-user
- design for fabrication (considering the potential and limitations of available fabrication processes), but also understand the background of quality requirements set for the fabrication tolerances
- understand the overview on the fabrication costs, and design impacts on them
- have encouragement to design and make fabrication plans later in industry, unprompted
- apply experience to practical design work in the integrated design & fabrication process (in R&D and workshops)

Content

EN: The course deals with the following topics:
- Design and analysis procedure of industrial steel structures based on available load information, durability requirements and main boundary conditions given by mechanical system

- Use of practical design tools (analytical and numerical) and optimization approaches to design energy efficient constructions

- Working as a member of design group, consisting of design/analysis and fabrication experts

- Fabrication plans, particularly welding process specifications (WPSs) for a structure, or a complete structural member of it

- Methods to take into consideration the available workshop facilities when choosing fabrication processes and evaluating fabrication costs.

- Practical interactive process between design and fabrication to find a compromising solution considering strength requirements and fabrication costs of critical structural details.

- Documentation of design and fabrication plan.

The course module provides knowledge about the design, analysis and fabrication process of demanding structural applications needed in Power-to-X solutions.

Additional information

EN: ***
The course is related to UN's Sustainable Development Goals (SDG): 9 Industry, Innovation and Infrastructure, 12 Responsible consumption and Production, 13 Climate Action, 17 Partnerships for the Goals

Study materials

EN: The course is an assignment work-based course. Consequently, the course applies learning material from the MSc-1 Steel Structures courses, such as BK80A2303 Steel Structures II.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	5 cr
Course Completion		5 cr

BK70A0600 Computational Methods in Mechanics

BK70A0600 Computational Methods in Mechanics

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	5 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LES, Mechanical Engineering 100%
Responsible persons	Annukka Ilves, Administrative person Grzegorz Orzechowski, Responsible teacher
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta

Prerequisites

EN: Students are recommended to have basic skills in programming and matrix calculus. Experience in kinematics and dynamics is also advised, but not required.

Learning outcomes

EN: The student will learn and practice computational methods commonly used in mechanics. Special attention will be put to the numerical analysis of the kinematics and dynamics of the vibrating and rigid multibody systems. The students will familiarize themselves with the basic theory behind such systems and the numerical methods commonly used to solve them. This will include a solution of the nonlinear equations, sparse and dense linear algebra, and integration of the equations of motion. Good programming practices will be strongly emphasized. The student will learn how to write efficient, clear, and manageable engineering code using high-level linear algebra software like Matlab.

Content

EN: Techniques for correct and efficient programming using Matlab. Sparse and dense matrix computations, debugging of the code. Common code mistakes and good practices. Numerical solution of the equations of motion of vibrating and multibody systems. Numerical integration of the ordinary differential equations and differential-algebraic equations. Explicit and implicit integration methods and constraint stabilization. Newton-Raphson method for the solution of nonlinear systems of equations. Introduction to unit tests.

Additional information

EN: This course supports the UN Sustainable Development Goal 9: Industry, Innovation and Infrastructure

Study materials

EN: Matlab documentation.
Linge S. and Langtangen H. P., Programming for Computations - MATLAB/Octave: A Gentle Introduction to Numerical Simulations with MATLAB/Octave. Springer, 2016, ISBN 978-3-319-32451-7.
Shabana A. A., Dynamics of Multibody Systems. Cambridge University Press, 2005, ISBN: 978-0-511-61052-3.

Nikravesh P. E., Planar Multibody Dynamics: Formulation, Programming with MATLAB®, and Applications. CRC Press, 2018, ISBN 978-1-138-09612-7.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	5 cr
Course Completion		5 cr
Method 2	Recurrence 1: 1. period-2. period	5 cr
Course Completion		5 cr

BK50A5400 3D-Forming and Converting of Materials

BK50A5400 3D-Forming and Converting of Materials

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	5 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LES, Mechanical Engineering 100%
Responsible persons	Annukka Ilves, Administrative person Ville Leminen, Responsible teacher Mahdi Merabtene, Responsible teacher Panu Tanninen, Responsible teacher
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: The course is suitable for distance learning however exam will take place at Exam Room.

Prerequisites

EN: Sustainable Materials and Machinery for packaging (Highly recommended)

Recommended prerequisites

BK50A5300 Sustainable Materials and Machinery for Packaging

Equivalences to other studies

BK10A5002 Modern Packaging Lines, Machinery and Package Manufacturing

or

BK50A5900 Strategic Product Design Success Stories Workshop

Equivalences (free text field)

EN: In PSP can replace course BK50A4500 Advanced Metal Materials Processing 5 op

Learning outcomes

EN: After this course, the student is able to understand and categorize operations and functions of modern forming and converting processes, emphasizing manufacturing and polymer- and fibre-based materials in packaging solutions. Students are expected to learn and recognize possibilities/limitations of forming and converting processes and tooling. They will be able to work independently to solve variable assignments such as quizzes on weekly basis.

Content

EN: The course covers several topics in 3D-forming and converting of materials with a focus in the field of packaging technology. The course includes topics such as:

- Creasing and die cutting in paperboard packaging for structural integrity and functionality.
- Heat-sealing methods and parameters for creating a seal-tight product and ensuring safety, containment, and shelf-life extension.
- 3D converting methods including extrusion, compression molding, injection molding, multi-injection molding, blow molding, and rotational molding.
- Thermoforming process and its industrial applications in producing plastic and fibre-based products.
- Packaging machinery in the food industry, including Vertical Form Fill Seal (VFFS) and Horizontal Form Fill Seal (HFFS) systems.
- Advancements in 3D forming of paperboard through press-forming, deep-drawing, and hydroforming.
- Use of simulation in forming processes, focusing on extrusion, injection molding, and thermoforming.
- Paper cup and molded pulp packaging for environmentally friendly and sustainable solutions.
- Application of robotics in packaging technology and future development.

Additional information

EN:

- This is a Full digital and independent study course. The final exam will take place at Exam Room.
- Students must attend the live online lectures on week 36, 41, and 46.
- The course contents are related especially to the Sustainable Development Goal (SDG) 12 "Responsible consumption and production" to cover the sustainability aspects of manufacturing solutions for packaging and other products.

Study materials

EN: Material will be informed in Moodle

Literature

"Packaging Technology Fundamentals, Materials, and Processes" by Anne Emblem and Henry Emblem (2012). Included chapters are 7 – 16 and 20.

"Advanced Thermoforming: Methods, Machines and Materials, Applications, and Automation" by Sven Engelmann (2012). Included chapters are 20 – 41.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	5 cr
Course Completion		5 cr

BK70A0800 Computer Aided Engineering

BK70A0800 Computer Aided Engineering

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	5 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LES, Mechanical Engineering 100%

Responsible persons	Annukka Ilves, Administrative person Jussi Sopanen, Responsible teacher Eerik Sikanen, Responsible teacher Giota Goswami, Responsible teacher
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Place of study: Lappeenranta

Prerequisites

EN: Students are recommended to have completed BK70A0500 Machine Dynamics.

Learning outcomes

EN: The student will learn, and practice computational methods commonly used in vibration analysis. The special attention will be put to numerical analysis of the rotating systems using 3D solid finite element method. The student familiarizes with the basic theory behind such systems and the numerical methods commonly used to solve them. This will include sparse and dense matrix linear algebra, integration of the equations of motion, eigenvalue analysis, model-order reduction techniques and solution of the nonlinear systems of equations. Good programming practices will be strongly emphasized. The student will learn how to write efficient, clear and manageable engineering code using the high-level linear algebra software Matlab.

Content

EN: Numerical modeling techniques for correct and efficient programming using Matlab. Sparse and dense matrix computations, debugging and profiling of the code. Common code mistakes and good practices. Numerical solution of the equations of motion of rotating systems. Eigenvalue analysis of linearized systems. Numerical integration of the ordinary differential equations for analysis of nonlinear systems. Practical modeling and analysis techniques using commercial finite element software.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	5 cr
Course Completion		5 cr

BK80A1402 Fatigue Design

BK80A1402 Fatigue Design

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	5 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LES, Mechanical Engineering 100%
Responsible persons	Antti Ahola, Responsible teacher Timo Björk, Responsible teacher Annukka Ilves, Administrative person Edris Dabiri, Responsible teacher
Study level	Basic studies

Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta

Prerequisites

EN: BK80A2701 Lujuusoppi recommendedFamiliarity with basics of mechanics of materials is required.

Recommended prerequisites

BK80A2303 Steel Structures II

BK80A3400 Design of Advanced Plate and Shell Structures

BK80A1302 Applications for FE-method for Steel Structures

Learning outcomes

EN: By the end of the course, students will be able to
- understand fatigue phenomenon as a material failure mechanism
- know and apply different assessment approaches to analyze fatigue strength of components for mechanical engineering
- know how to design fatigue loaded structures for demanding application
- understand how to avoid fatigue failure

Content

EN: The course deals with the following topics:
- Design principals to avoid fatigue failure of mechanical engineering components and structures

- Introduction to fatigue in micro and macro scale, deformation of structural materials, stress concentrations and fracture mechanics

- Design of structures based on stress-life approach, strain-life approach and linear elastic fracture mechanics.

The course module provides knowledge about the use of fatigue design methodologies that provides deep understanding to assess the structural life cycle of mechanical components used in Power-to-X applications.

Additional information

EN: The course is intended for elective studies for the students in the Steel Structure module.
***

The course is related to UN's Sustainable Development Goals (SDG): 9 Industry, Innovation and Infrastructure, 12 Responsible consumption and Production, 13 Climate Action, 17 Partnerships for the Goals

Study materials

EN: Lectures in Moodle.
Dowling N.E., Mechanical Behavior of Materials 2nd, 3rd or 4th ed., Prentice Hall.

Stephens R. et al., Metal Fatigue in Engineering 2nd ed., John Wiley ; Sons.

Schijve J., Fatigue of Structures and Materials 2nd ed., Springer.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	5 cr
Course Assessment		5 cr
Course Enrolment		0 cr

BK20A3200 Welding Quality and Economy

BK20A3200 Welding Quality and Economy

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	5 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LES, Mechanical Engineering 100%
Responsible persons	Tuomas Skriko, Responsible teacher Annukka Ilves, Administrative person
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta

Prerequisites

EN: Basic understanding and knowledge of welding and welding processes.

Equivalences to other studies

BK20A2800 Quality Management and Assurance in Welding Production

or

BK20A2900 Welding Work and Economy

or

BK30A1301 Laser Based Manufacturing for Design

Learning outcomes

EN: The aim of the course is to guide the student to develop, manage, control and ensure the quality and sustainability in welding production as well as get knowledge and familiar with the welding work and its economy. After having completed and passed this course, the student:

- understands the meaning of sustainability and quality in welding production,
- knows how to implement quality assurance systems,
- knows quality levels and classifications in welding,
- is familiar with the concept of Welding Procedure Specification (WPS), its development, approval, and implementation,
- understands welding imperfections and various testing procedures (destructive and non-destructive) of weld joints,
- is familiar with most important welding quality standards,
- knows special welding process variations for enhancing productivity,
- has a knowledge regarding the production chain of welded structures,
- understands economics, costs, and productivity of welding production,
- understands welding networks and supply chains,
- has a general overview of production management systems and methods,
- is familiar with welding safety and health hazards.

Content

EN: The course comprises lectures, of which themes are:

- Concept of sustainability and quality
- Welding coordination and standards
- Welding procedure specification (WPS) and welding procedure test
- Welding defects and imperfections as well as weld classification system and levels
- Testing methods in welding production
- Repair welding
- Welding productivity improvement methods
- Economics and cost accounting of welding procedures and investments
- Welding work indicators
- Welding networks and supply chains
- Welding safety aspects in workshop production
- Case examples from practical welding industry work

The course contains laboratory exercises, some practical case studies based on industrial tasks of a welding engineer and assignments related to productivity, economy, profitability and safety of welding work, such as:

- Designing the Welding Procedure Specification (WPS) and performing the welding procedure test according to standards.
- Identifying welding defects and imperfections from real weldments.
- Interpreting results of destructive and non-destructive welding tests.
- Coordination and reporting of the welding procedure test.
- Modifications and developments of welding processes.
- Cost calculations of welding operations.
- Different levels of welding production chains.
- Evaluating the safety risks of welding production and workplaces.

Additional information

EN: The course is related to UN Sustainable Development Goals (SDGs): 4 Quality education, 9 Industry, innovation and infrastructure, 12 Responsible consumption and production, 13 Climate action.

Study materials

EN:

- Lectures in Moodle.
- Welding: Principles and Applications, L. Jeffus, Cengage.
- The Welding Workplace, R. Boekholt, Woodhead Publishing.
- Standards related to welding quality and production.
- Videos of welding quality operations and processes in Moodle.
- Additional material (e.g., laboratory demos) in Moodle.
- Case materials from welding industry.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	5 cr
Course completion		5 cr
Method 2	Recurrence 1: 1. period-2. period	5 cr
Course completion		5 cr

BK70A0900 Hardware and Software of Automated Vehicles

BK70A0900 Hardware and Software of Automated Vehicles

Abbreviation: HSAV

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	5 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LES, Mechanical Engineering 100%
Responsible persons	Adam Klodowski, Responsible teacher Annukka Ilves, Administrative person
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: This is a cool course

Prerequisites

EN: The course is cross-disciplinary, and most of the concepts will be introduced from the basic level. Nevertheless, some basic knowledge in software programming is helpful. We recommend, but not require, Matlab courses, Python programming, C, or C++ to understand basic concepts of conditional statements, loops and use of variables. In the course only simple programming will be required to show how control logic can be implemented, so any basic course in programming is enough. Basic Unix/Linux system knowledge is also beneficial as Linux will be used in some exercises.

Recommended prerequisites

BM20A9400 Project Work in Matlab

KTE2229 Modelling and Simulation Using MATLAB and Simulink

Equivalences to other studies

BK60A1500 Practical Laboratory Course in Motion Control and Mechatronics

Learning outcomes

EN: After completing this course student will be able to recognize the possibilities and limitations of the autonomous vehicle technology. Discuss various tools to cover safety and security inside and outside autonomous vehicles. Learn how to do basic simulation of vehicle and environment and test control strategies in such environments. Learn about hardware and software used in autonomous vehicles and how it compares to human operated machines.

Content

EN: Course comprises of 10 lecture topics:
1. Introduction

2. Sensors and situational awareness

3. Vehicle simulation - part 1 - dynamics

4. Vehicle simulation - part 2 - sensors integration

5. Vehicle simulation - part 3 - predictive control

6. Vehicle simulation - part 4 - high-level control and navigation

7. Autonomous mobility infrastructure

8. External lecture by invited industry or academic specialist

- Topic and lecturer will be announced on one of the first lectures in the course

9. Cyber security

10. Cyber security in connected cars: threats, attacks, and protection

Study materials

EN: Will be provided in Moodle

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	5 cr
Course completion		5 cr
Method 2	Recurrence 1: 1. period-2. period	5 cr
Course completion		5 cr

BK30A1700 Advanced Additive Manufacturing and 3D Printing

BK30A1700 Advanced Additive Manufacturing and 3D Printing

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	5 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LES, Mechanical Engineering 100%
Responsible persons	Ilkka Poutiainen, Responsible teacher Annukka Ilves, Administrative person
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta, kokonaan verkossa / full digi

Prerequisites

EN: Advanced knowledge level of engineering sciences.

Recommended prerequisites

BK30A1600 Laser and Additive Manufacturing Systems

Equivalences to other studies

BK30A1500 Additive Manufacturing and 3D Printing (Advanced)

Learning outcomes

EN: Student will know following fields of additive manufacturing (aka 3D printing) after passing course:
- characteristics of materials used in AM,

- different properties of AM parts,

- comprehensive understanding of product design for AM (DfAM),

- details of simulation driven DfAM.

- latest knowledge of AM technologies and materials,

- have skills that are needed to help reform technological readiness in different industries

- have understanding Additive manufacturing solutions for advanced energy sector industry in the future

Content

EN: In this course a practical approach is taken to understand multiple steps in design and preparation work. The focus is on the metal additive manufacturing and its special characteristics. Different DfAM steps are presented. Guidelines for support structures and light weight design are given. Material selection and effect of material properties in the strength (or function) of the structure is discussed.

Additional information

EN: Course is online course and course material is provided in Moodle.

Study materials

EN: Course material provided in Moodle during course. Further reading e.g. Gibson, I., Rosen, D. W., Stucker, B.: Additive Manufacturing Technologies.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	5 cr
Course completion		5 cr
Method 2	Recurrence 1: 1. period-2. period	5 cr
Course completion		5 cr

CT60A5103 Software Engineering Models and Modeling

CT60A5103 Software Engineering Models and Modeling

Abbreviation: CT00CM03

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	6 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Software Engineering 100%
Responsible persons	Jonna Naukkarinen, Administrative person Antti Knutas, Responsible teacher
Study level	Intermediate studies
Study field	Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs)

Tweet text

EN: Location: Lappeenranta and Lahti

Prerequisites

EN: Bachelor's thesis or degree completed.

Learning outcomes

EN: Software modeling (this course) is aimed at reducing the gap between problem and software implementation through the development and use of models, which describe complex systems at multiple levels of abstraction and from a variety of perspectives. A model is an abstraction (one aspect or entire system) of an existing or planned system. Models are created to serve particular purposes, for example, to present a human-understandable description of some aspect of a system or to predict its quality.

The course is focused at building a deep understanding of the concept of model and modeling while enabling the students to be able to:

1. Master the importance of conceptual modeling techniques in software engineering and the diverse types of models.

2. Understand and select the appropriate modeling method or methods for the software development project at hand and for the various types of software systems such as critical-safety systems, interactive consumer services, enterprise applications, hardware software, etc.

3. Manage, plan, analyze and contribute to various models to represent requirements, design, implementation and maintenance of large intensive software products, systems and services.

4. Understand how human, social and technical factors may have (both) positive and negative influence on the methods and practices of modelling in software engineering.

5. Identify the modeling challenges facing the software engineering research community as well as the avenues for further investigations.

Content

EN: Modeling in Software Engineering Body of Knowledge (SWEBOK). Principles and foundations of software engineering. Formal methods. Prototyping techniques. Object-oriented modeling. Data-centric models. Model-driven architecture (MDA). Modeling techniques. Importance of modeling in software development projects and processes.

Additional information

EN: The course is related to UN's sustainable development goals (SDG): 4 quality education, 8 decent work and economic growth, 9 industry, innovation and infrastucture

Study materials

EN: Main coursebook:
Ian Sommerville. 2015. *Software Engineering,* 10th edition. Pearson, USA.
Good (if longer) book to continue with after Sommerville:
Pressman, R. S. (2005). *Software engineering: a practitioner's approach*. Palgrave Macmillan.

Additional material and reading will be provided in the course.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	6 cr
¤LAB/LUT: Course Completion		6 cr

CT60A5500 Quality Assurance in Software Development

CT60A5500 Quality Assurance in Software Development

Curriculum period	2024-2025
Validity period	since 1 Aug 2024

Credits	6 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Software Engineering 100%
Responsible persons	Jonna Naukkarinen, Administrative person Azeem Akbar, Responsible teacher
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs)

Tweet text

EN: Location: Lappeenranta

Equivalences to other studies

CT60A5300 Software Projects, Processes and Entrepreneurship

Learning outcomes

EN: After the course students are able to do the following activities in the key areas of software development based on the available literature

1. Understand different approaches to software quality assurance
2. Distinguish between the various activities of quality assurance, quality planning and quality control
3. Understand the nature of software defects
4. Be able to record and track defects in your project
5. Understand the importance of standards in the quality management process and their impact on the final product.

Content

EN: Software quality in software development. Four dimensions of quality (specification, design, development, conformance). Quality management processes. Quality in software construction. Software validation and the role of software verification in SQA. Quality tools. Quality measurement and metrics. Software QA standards. SQA in practise and SQA for small projects.

Study materials

EN: Laporte, C. Y., & April, A. (2018). *Software quality assurance*. John Wiley & Sons.
Chemuturi, Murali. (2011). *Mastering Software Quality Assurance - Best Practices, Tools and Techniques for Software Developers*. J. Ross Publishing, Inc. ISBN 978-1-60427-032-7.

Other reading material shared during the course, including reading material on quality assurance in agile.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	6 cr
Course Completion		6 cr
Method 2	Recurrence 1: 1. period-2. period	6 cr
Course Completion		6 cr

CT70A5000 Impact and Benefits of Digitalization

CT70A5000 Impact and Benefits of Digitalization

Curriculum period	2024-2025
Validity period	since 1 Aug 2024

Credits	6 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Software Engineering 100%
Responsible persons	Jonna Naukkarinen, Administrative person Ari Happonen, Responsible teacher
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs)

Tweet text

EN: Location: Lappeenranta / Online

Prerequisites

EN: Bachelor's thesis or degree completed.

Learning outcomes

EN: The aim of the course is to give knowledge, tools, and methods which can be applied during the development of a digitalization strategy / project plan for an organization. Also the course will help the student to build team work skills and enhance time management skills, when working as a pair and in a group. After completing this course the student will be able to

1. Understand different levels and viewpoints of digitalization

2. Demonstrate team-working skills

3. Assess technologies from the viewpoint of an organization and understand how they enable new business services / new ways of working

4. Develop an overall digitalization strategy or plan a digitalization project for an organization

5. Compile a perception of digitalization based impacts for an organization and also consider different possibilities to achieve the set and desired benefits

6. Evaluate course context related research articles and write a reasoned opinion(s) / learning reflections based on the articles

7. Understand the drivers and rush towards digital and platform economies trough digitalization

Content

EN: Drivers of digitalization; The benefit vs. the challenge of digitalization (in broad and specific contexts); Industry, personal life and society digitalization, digital ecosystem(s), value and challenges of digitalization; changing business models and opportunities (because of digitalization); new / front line technology evaluation reporting; digitalization in specific industry context (e.g. DevSecOps in software engineering, IoT and robotization vs. industrial revolution, AI as digitalization driver in the society)

Additional information

EN: The course is related to UN's Sustainable Development Goals (SDG): 4 quality education, 5 gender equality, 8 decent work and economic growth, 9 industry, innovation and infrastructure, 10 reduced inequalities, 17 partnership for the goals

Study materials

EN: Materials for those who want to prepare /restudy for the course. Research articles to be named, linked and recommended to read change yearly.

Reading package:

Buxmann P. et al. The software industry: economic principles, strategies, perspectives. – Springer Science ; Business Media, 2012.
Kemper A. Valuation of Network Effects in Software Markets: A Complex Networks Approach. – Springer Science ; Business Media, 2009
Martin Ford. Rise of the Robots: Technology and the Threat of a Jobless Future. – Basic Books, 2015.
Rauser, Alexander. Digital strategy: a guide to digital business transformation – CreateSpace Independent Publishing Platform, 2016.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	6 cr
Course Completion		6 cr

CT10A2400 Digitalization and Sustainability

CT10A2400 Digitalization and Sustainability

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	6 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Software Engineering 100%
Responsible persons	Jonna Naukkarinen, Administrative person Jari Porras, Responsible teacher
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs)

Tweet text

EN: Course will be arranged as a collaborative course with Vrije University Amsterdam

Learning outcomes

EN: At the end of the course, the students will:
- be familiar with basic knowledge about digitalization and digital transformation, sustainability, and the role of digitalization in achieving business- and other sustainability goals within society and organizations (Knowledge and understanding).

- be able to reason about the technology- and business-related digitalization and sustainability concerns, and apply their reasoning to a concrete project (Applying knowledge and understanding).

- have a basic understanding of the types of sustainability impacts of digital solutions. They will also be able to identify and assess the trade-offs between the different sustainability concerns addressed by digital solutions (Making judgments).

-be able to write a scientific report about a concrete digitalization-and-sustainability project in a group of students (Communication skills).

-be trained to (i) explore the problem- and solution space in the digital transition of a specific sector/domain, and (ii) identify and address a set of relevant sustainability goals (Learning skills).

Content

EN: The course follows a flipped-class approach and includes a mix of video-lectures, active discussions, and teamwork.
The lectures explain the basic concepts related to digitalization (such as the notions of digitalization and digital transformation, the role of technology, and the impact on business and society) and sustainability (such as the notions of sustainable software and software for sustainability, how to frame sustainability-quality concerns in the design of digital solutions, and how to assess sustainability impacts).
Discussions are based on the video-lectures and a set of papers the students will reflect upon. The students participate in small teams to incrementally develop an understanding of the digitalization transformation of a selected sector/domain and the related sustainability concerns, and work on a shared project report.

Additional information

EN: Course schedule is synchronized with the implementation in Vrije University Amsterdam.
Course impacts can be seen in different SDGs and their targets depending on the topic students select for their project work. Digitalization touches 103 of the 169 SDG targets (Gesi - Digital with purpose) and as such there's lot to choose.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period	6 cr
Course Completion		6 cr

CT10A7004 Sustainability and IT

CT10A7004 Sustainability and IT

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	6 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Software Engineering 100%
Responsible persons	Jonna Naukkarinen, Administrative person Jari Porras, Responsible teacher Sanaul Haque, Responsible teacher
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs)

Tweet text

EN: Location: Lappeenranta

Prerequisites

EN: Bachelor's thesis or degree completed.

Learning outcomes

EN: At the end of this course students will be able to:
1. Identify various sustainable development challenges in the surrounding society

2. Demonstrate the critical thinking and argumentation skills in the discussions of sustainable development challenges
3. Identify the possibilities of IT and especially software engineering in the sustainable development challenges
4. Apply IT and especially software engineering for sustainable development challenges

Content

EN: The course emphasizes the role and impact of IT field and especially software engineering in the sustainable development. The topic is covered through selected books and scientific articles. Students may be divided into small groups that will each study the topic.

Additional information

EN: The course will be arranged for fall, spring, and summer. A student may take this as online self-study all around the year. The lessons-based approach is available for students in the fall and spring semesters. The lessons-based approach has mandatory sessions.
The course looks at the sustainability of IT from many different perspectives and considers many SDGs. The software sustainability book by Coral Calero et al. claims that software sustainability touches mainly SDG 7, 8, 9, 12, 13, and 17, but in reality, the software can impact every one of the SDGs and their targets.

Study materials

EN: Online self-study material is given in Moodle and is based or various articles. Lessons based approaches announce the material for each installation separately.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 3. period-4. period	6 cr
Course Completion		6 cr
Method 2	Recurrence 1: 1. period-2. period Recurrence 2: Summer	6 cr
Course completion, self-study		6 cr

CT10A7022 Personal Literature Study

CT10A7022 Personal Literature Study

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	6 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Software Engineering 100%
Responsible persons	Jonna Naukkarinen, Administrative person Jari Porras, Responsible teacher Sanaul Haque, Responsible teacher
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs)

Equivalences (free text field)

EN: Replaces CT10A7021 Personal Literature Study

Learning outcomes

EN: The course deepens students' understanding of a research topic through a literature study.
At the end of this course students will be able to:

1. Identify the needs for literature study in a field of interest.

2. Formulate proper literature searches to cover the selected topic.

3. Demonstrate the knowledge of literature review techniques and tools.

4. Demonstrate academic skills in writing a report of the findings.

Content

EN: Selected type of literature study on a selected theme. Depending on the need, the literature study may follow the guidelines of systematic literature review, systematic mapping study, snowballing etc. Students will be introduced to these methods and possible tools in the beginning of the course. A list of selected themes for the possible literature reviews can be found at the course page in Moodle. Student may also propose his/her own topic (e.g. on the field of thesis work). The student contacts then instructor and agrees on the personal implementation of the study including the workload and the schedule. Students produce a report based on the literature by the end of the course semester (fall or spring).

Additional information

EN: The course can be done in lecture-based or online self-study mode. Lecture-based consist of lectures on different topics, while in online mode, students follow videos and other material provided on moodle pages. Fall lectures are meant for doctoral students (focus on SLR), while spring lectures are for master's students (focus on snowballing).
The SDGs touched in this course depend heavily on the topic selected for the literature review.

Study materials

EN: Articles describing different literature approaches are pointed out in Moodle.
Videos describing the phases of literature reviews are given in Moodle.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period Recurrence 2: 3. period-4. period Recurrence 3: Summer	6 cr
Course Completion		6 cr

CT70A7000 Digital Business Platforms

CT70A7000 Digital Business Platforms

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	6 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Software Engineering 100%
Responsible persons	Jonna Naukkarinen, Administrative person Damian Kedziora, Responsible teacher
Study level	Advanced studies

Study field	Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs)

Tweet text

EN: Location: Lappeenranta

Prerequisites

EN: Bachelor's thesis or degree completed.

Learning outcomes

EN: At the end of the course students will be able to
1. Have expertise of the fundamental principles of key enabling pillars and platforms for digital business
2. Understanding how different platforms will add value to digital business
3. Understanding how data analytics will enhance value of heterogeneous data
4. Understand the role of stakeholders, technology trends and business challenges of software technology for being able to build a customer-centric culture and customer understanding
5. Master a digital business platform help to reengineer existing services, business processes and creating new digital services

Content

EN: Introduction to pillars of and platforms for digital business: IoT (Internet of Things), 5G and CPS (Cyber Physical Systems), Data and Analytics (Big data), Ecosystems (Cloud evolution and Software as a service), strategies (Cybersecurity) and technologies (Distributed Ledgers, e.g. block chain), Information Systems, Customer experience and Business platforms.

In-depth discussion of platforms examples from different industries for demonstrating the variety of possible approaches towards organizing and managing platforms. Identifying the patterns of technology and transformation underlying current and future platforms of digital business. Overview of the different design steps and important decisions in the development of a digital platform or in its selection for business needs.

Additional information

EN: Priority given to Digital Transformation students

Study materials

EN: Platform Revolution: How Networked Markets Are Transforming the Economy - And How toMake Them Work,', by G. Parker, M. Van Alstyne, S. Choudary, 2016.
Handouts during the class.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	6 cr
Course Completion		6 cr

CT80A0200 Software Business

CT80A0200 Software Business

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	6 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT

Responsible organisation	LENS, Software Engineering 100%
Responsible persons	Jonna Naukkarinen, Administrative person Tarja Pettinen, Administrative person Sami Hyrynsalmi, Responsible teacher
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs)

Prerequisites

EN: Bachelor's thesis or degree completed.

Equivalences to other studies

CT60A7322 Software Business Development

CT70A6100 Advanced Course on Software Business

Equivalences (free text field)

EN: The course replaces old courses CT60A7322 Software Business Development and CT70A6100 Advanced Course on Software Business.

Learning outcomes

EN: After completing the course, the student has knowledge of basic mechanisms of the software-intensive business markets, as well as revenue and business models of software companies.

Content

EN: The course presents economical theories seen in the software industry as well as covers different revenue and business models. Finally, the course introduces the internationalization models of software-intensive companies.

Additional information

EN: The course is offered either as an anytime-course or a guided, hybrid course in Lahti campus. The anytime-course can be started at any point of the year.

The course is related to UN's sustainable development goals (SDG): 8 decent work and economic growth; 9 industry, innovation and infrastructure.

Study materials

EN: The course book (Buxmann et al. 2013) and the materials given by the teacher.

Literature

Buxmann, P., Diefenbach, H., Hess, T. (2013) The Software Industry: Economic Principles, Strategies, Perspectives. Springer-Verlag Belin.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 3. period-4. period	6 cr
Course Completion		6 cr
Method 2	Recurrence 1: Summer-Summer	6 cr
Course Completion		6 cr

K200CE69 Finnish 1

K200CE69 Finnish 1

Abbreviation: K200CE69

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	3 cr
Languages	Finnish
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LAB, language 100%
Responsible person	Elina Niskanen, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs) Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction Fields of education (Ministry of Education and Culture), Social sciences

Prerequisites

EN: Details available in Completion methods under the header Teaching

Learning outcomes

EN: The student is able to - identify and use the course vocabulary and phrases for common everyday situations - tell about oneself and understand basic questions - read and write simple sentences related to the course topics.

Additional information

EN:

Study materials

EN: Details available in Completion methods under the header Teaching

Completion method and assessment items	Recurrence	Credits
Method 1		3 cr
¤LAB/LUT: Course Completion		3 cr

K200CE70 Finnish 2

K200CE70 Finnish 2

Abbreviation: K200CE70

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	3 cr
Languages	Finnish
Grading scale	General scale, 0-5

University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LAB, language 100%
Responsible person	Elina Niskanen, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs) Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction Fields of education (Ministry of Education and Culture), Social sciences

Prerequisites

EN: Details available in Completion methods under the header Teaching

Learning outcomes

EN: The student is able to - communicate in most common everyday situations - understand slowly and clearly spoken Finnish when the topic and the vocabulary are familiar - understand and write a simple message or text - use the basic vocabulary and some grammatical structures of Finnish.

Study materials

EN: Details available in Completion methods under the header Teaching

Completion method and assessment items	Recurrence	Credits
Method 1		3 cr
¤LAB/LUT: Course Completion		3 cr

K200CH62 Finnish 3

K200CH62 Finnish 3

Abbreviation: K200CH62

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	3 cr
Languages	Finnish
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LAB, language 100%
Responsible person	Tarja Saarnisto, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs) Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction Fields of education (Ministry of Education and Culture), Social sciences

Prerequisites

EN: Details available in Completion methods under the header Teaching

Study materials

EN: Details available in Completion methods under the header Teaching

Completion method and assessment items	Recurrence	Credits
Method 1		3 cr
¤LAB/LUT: Course Completion		3 cr

K200CH63 Finnish 4

K200CH63 Finnish 4

Abbreviation: K200CH63

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	3 cr
Languages	Finnish
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LAB, language 100%
Responsible person	Tarja Saarnisto, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs) Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction Fields of education (Ministry of Education and Culture), Social sciences

Prerequisites

EN: Details available in Completion methods under the header Teaching

Study materials

EN: Details available in Completion methods under the header Teaching

Completion method and assessment items	Recurrence	Credits
Method 1		3 cr
¤LAB/LUT: Course Completion		3 cr

K200CL50 Finnish for Work 1

K200CL50 Finnish for Work 1

Abbreviation: K200CL50

Curriculum period	2024-2025

Validity period	since 1 Aug 2024
Credits	5 cr
Languages	Finnish
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LAB, language 100%
Responsible person	Pirjo Rantonen, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs) Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction Fields of education (Ministry of Education and Culture), Social sciences

Prerequisites

EN: Details available in Completion methods under the header Teaching

Study materials

EN: Details available in Completion methods under the header Teaching

Completion method and assessment items	Recurrence	Credits
Method 1		5 cr
¤LAB/LUT: Course Completion		5 cr

K200CP86 Finnish for Work 3

K200CP86 Finnish for Work 3

Abbreviation: K200CP86

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	5 cr
Languages	Finnish
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LAB, language 100%
Responsible person	Pirjo Rantonen, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs) Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction Fields of education (Ministry of Education and Culture), Social sciences

Prerequisites

EN: Details available in Completion methods under the header Teaching

Learning outcomes

EN: Proficiency level B1 The students will be able to - communicate in informal and formal discussions at work - communicate in customer service and complaint situations - compose work-related e-mail messages.

Study materials

EN: Details available in Completion methods under the header Teaching

Completion method and assessment items	Recurrence	Credits
Method 1		5 cr
¤LAB/LUT: Course Completion		5 cr

KM00CO04 Finnish Culture and Society

KM00CO04 Finnish Culture and Society

Abbreviation: KM00CO04

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	3 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LAB, language 100%
Responsible person	Jaana Häkli, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs) Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction Fields of education (Ministry of Education and Culture), Social sciences

Prerequisites

EN: Details available in Completion methods under the header Teaching

Learning outcomes

EN: The student is able to - work and live in Finland or with the Finns without major cultural conflicts. - use the basic information on Finnish history, society, design, welfare state, identity and nature etc. to understand values, customs and habits in Finland. - get deeper cultural experiences in Finland through functional and experiential activities and visits related to Finnish culture.

Study materials

EN: Details available in Completion methods under the header Teaching

Completion method and assessment items	Recurrence	Credits
Method 1		3 cr
¤LAB/LUT: Course Completion		3 cr

K200CU41 Suomi with Love 1

K200CU41 Suomi with Love 1

Abbreviation: K200CU41

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	3 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LAB, language 100%
Responsible person	Sanna Paunonen, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs) Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction Fields of education (Ministry of Education and Culture), Social sciences

Prerequisites

EN: Details available in Completion methods under the header Teaching

Learning outcomes

EN: The student is able to - identify and use the course vocabulary and phrases for common everyday situations - tell about oneself and understand basic questions - read and write simple sentences related to the course topics. Proficiency level: A1

Study materials

EN: Details available in Completion methods under the header Teaching

Completion method and assessment items	Recurrence	Credits
Method 1		3 cr
¤LAB/LUT: Course Completion		3 cr

KE00BZ84 English for Professional Development (Business)

KE00BZ84 English for Professional Development (Business)

Abbreviation: KE00BZ84

Curriculum period	2024-2025
Validity period	since 1 Aug 2024

Credits	4 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LAB, language 100%
Responsible person	Tessa Laba, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs) Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction Fields of education (Ministry of Education and Culture), Social sciences

Prerequisites

EN: Details available in Completion methods under the header Teaching

Learning outcomes

EN: Proficiency level: B2 Students are able to communicate clearly and effectively in different generic and field-specific work place situations both orally and in writing; find, evaluate and use information effectively and function collaboratively in international working environments.

Additional information

EN:

Study materials

EN: Details available in Completion methods under the header Teaching

Completion method and assessment items	Recurrence	Credits
Method 1		4 cr
¤LAB/LUT: Course Completion		4 cr

KE00BZ85 English for Professional Development (Technology)

KE00BZ85 English for Professional Development (Technology)

Abbreviation: KE00BZ85

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	4 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LAB, language 100%
Responsible persons	Hwei-Ming Boey, Responsible teacher Olesya Kullberg, Responsible teacher
Study level	Basic studies

Study field	Fields of education (Ministry of Education and Culture), Business, administration and law Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs) Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction Fields of education (Ministry of Education and Culture), Social sciences

Prerequisites

EN: Details available in Completion methods under the header Teaching

Learning outcomes

EN: Proficiency level: B2 Students are able to communicate clearly and effectively in different generic and field-specific work place situations both orally and in writing; find, evaluate and use information effectively and function collaboratively in international working environments

Additional information

EN:

Study materials

EN: Details available in Completion methods under the header Teaching

Completion method and assessment items	Recurrence	Credits
Method 1		4 cr
¤LAB/LUT: Course Completion		4 cr

KE00BZ83 English for Professional Development (ESTIEM)

KE00BZ83 English for Professional Development (ESTIEM)

Abbreviation: KE00BZ83

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	4 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LAB, language 100%
Responsible person	Ritva Kosonen, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs) Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction Fields of education (Ministry of Education and Culture), Social sciences

Prerequisites

EN: Details available in Completion methods under the header Teaching

Learning outcomes

EN: Proficiency level: B2 Students are able to communicate clearly and effectively in different generic and field-specific work place situations both orally and in writing; find, evaluate and use information effectively and function collaboratively in international working environments.

Additional information

EN:

Study materials

EN: Details available in Completion methods under the header Teaching

Completion method and assessment items	Recurrence	Credits
Method 1		4 cr
¤LAB/LUT: Course Completion		4 cr

KE00CG81 Business Writing

KE00CG81 Business Writing

Abbreviation: KE00CG81

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	3 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LAB, language 100%
Responsible person	Anneli Rinnevalli, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs) Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction Fields of education (Ministry of Education and Culture), Social sciences

Prerequisites

EN: Details available in Completion methods under the header Teaching

Learning outcomes

EN: Proficiency level: B2 The student is able to: - interpret business transaction documents - use field-specific business terminology and style of writing - prepare clear and accurate business messages in correct English - prepare explicit and effective texts for use within and outside the organization, and to meet the communicative needs.

Study materials

EN: Details available in Completion methods under the header Teaching

Completion method and assessment items	Recurrence	Credits
Method 1		3 cr
¤LAB/LUT: Course Completion		3 cr

KE00BZ81 Academic Writing

KE00BZ81 Academic Writing

Abbreviation: KE00BZ81

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	3 cr
Languages	English
Grading scale	Pass-Fail
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LAB, language 100%
Responsible person	Anneli Rinnevalli, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs) Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction Fields of education (Ministry of Education and Culture), Social sciences

Prerequisites

EN: Details available in Completion methods under the header Teaching

Learning outcomes

EN: Proficiency level: B2-C1 Students are able ·to identify the characteristics of academic writing ·to demonstrate their proficiency in applying academic writing conventions, both generic and discipline-specific, to their writing ·to demonstrate their ability to critical thinking and analysis ·to demonstrate ability in collaborative situations ·to produce a 6-page academic paper in pairs or in groups of three

Study materials

EN: Details available in Completion methods under the header Teaching

Completion method and assessment items	Recurrence	Credits
Method 1		3 cr
¤LAB/LUT: Course Completion		3 cr

KE00CG33 Writing for Digital Media

KE00CG33 Writing for Digital Media

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	4 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LAB, language 100%
Responsible person	Hamid Guedra, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs) Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction Fields of education (Ministry of Education and Culture), Social sciences

Prerequisites

EN: Details available in Completion methods under the header Teaching

Study materials

EN: Details available in Completion methods under the header Teaching

Completion method and assessment items	Recurrence	Credits
Method 1		4 cr
¤LAB/LUT: Course Completion		4 cr

KE00CQ38 Introduction to Copywriting

KE00CQ38 Introduction to Copywriting

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	2 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LAB, language 100%
Responsible person	Vesa Koskela, Responsible teacher
Study level	Basic studies

Study field	Fields of education (Ministry of Education and Culture), Business, administration and law Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs) Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction Fields of education (Ministry of Education and Culture), Social sciences

Completion method and assessment items	Recurrence	Credits
Method 1		2 cr
¤LAB/LUT: Course Completion		2 cr

KE00CG79 Professional Reading

KE00CG79 Professional Reading

Abbreviation: KE00CG79

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	3 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LAB, language 100%
Responsible person	Tessa Laba, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs) Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction Fields of education (Ministry of Education and Culture), Social sciences

Prerequisites

EN: Details available in Completion methods under the header Teaching

Learning outcomes

EN: Proficiency level: B2 Students are able to - comprehend, analyze and summarize authentic professional texts in English - learn and master strategies for expanding professional vocabulary - use strategies for effective reading.

Additional information

EN:

Study materials

EN: Details available in Completion methods under the header Teaching

Completion method and assessment items	Recurrence	Credits
Method 1		3 cr
¤LAB/LUT: Course Completion		3 cr

KE00CQ81 Effective Presentations

KE00CQ81 Effective Presentations

Abbreviation: KE00CQ81

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	2 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LAB, language 100%
Responsible person	Riitta Gröhn, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs) Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction Fields of education (Ministry of Education and Culture), Social sciences

Prerequisites

EN: Details available in Completion methods under the header Teaching

Learning outcomes

EN: Proficiency level: B2 Students are able to - plan, prepare and execute a persuasive and engaging presentation - use intonation and stress to amplify their message - use various delivery techniques such as pacing, chunking and repetition - design and use visual materials effectively in their presentation.

Study materials

EN: Details available in Completion methods under the header Teaching

Completion method and assessment items	Recurrence	Credits
Method 1		2 cr
¤LAB/LUT: Course Completion		2 cr

KE00BZ82 Professional Meetings and Discussions

KE00BZ82 Professional Meetings and Discussions

Abbreviation: KE00BZ82

Curriculum period	2024-2025
Validity period	since 1 Aug 2024

Credits	4 cr
Languages	English
Grading scale	Pass-Fail
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LAB, language 100%
Responsible person	Hwei-Ming Boey, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs) Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction Fields of education (Ministry of Education and Culture), Social sciences

Prerequisites

EN: Details available in Completion methods under the header Teaching

Additional information

EN:

Study materials

EN: Details available in Completion methods under the header Teaching

Completion method and assessment items	Recurrence	Credits
Method 1		4 cr
¤LAB/LUT: Course Completion		4 cr

KE00BX35 English Pronunciation

KE00BX35 English Pronunciation

Abbreviation: KE00BX35

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	1 cr
Languages	English
Grading scale	Pass-Fail
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LAB, language 100%
Responsible person	Samu Lattu, Responsible teacher
Study level	Basic studies

Study field	Fields of education (Ministry of Education and Culture), Business, administration and law Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs) Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction Fields of education (Ministry of Education and Culture), Social sciences

Prerequisites

EN: Details available in Completion methods under the header Teaching

Learning outcomes

EN: Students understand various English dialects and know about their special features. Students are able to pronounce English clearly

Additional information

EN:

Study materials

EN: Details available in Completion methods under the header Teaching

Completion method and assessment items	Recurrence	Credits
Method 1		1 cr
¤LAB/LUT: Course Completion		1 cr

KE00CC64 English Prep Course

KE00CC64 English Prep Course

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	3 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LAB, language 100%
Responsible person	Anneli Rinnevalli, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs) Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction Fields of education (Ministry of Education and Culture), Social sciences

Additional information

EN: Note. The course is not accepted in LUT university's degrees' compulsory language studies. It can however be included in free elective studies.

Study materials

EN: Details available in Completion methods under the header Teaching

Completion method and assessment items	Recurrence	Credits
Method 1		3 cr
¤LAB/LUT: Course Completion		3 cr

KD00CH39 German 1

KD00CH39 Saksa 1

Abbreviation: KD00CH39

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	3 cr
Languages	German
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LAB, language 100%
Responsible person	Pirjo Rantonen, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs) Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction Fields of education (Ministry of Education and Culture), Social sciences

Prerequisites

EN: Details available in Completion methods under the header Teaching

Learning outcomes

EN: The students will - understand slow and clear speech related to course topics - are able to communicate orally and in writing in simple everyday situations, such as introductions, telling about oneself and reacting e.g. in dining situations - are able to use the most frequent basic structures CEFR level A1

Additional information

EN:

Study materials

EN: Details available in Completion methods under the header Teaching

Completion method and assessment items	Recurrence	Credits
Method 1		3 cr
¤LAB/LUT: Course Completion		3 cr

KD00CH40 German 2

KD00CH40 Saksa 2

Abbreviation: KD00CH40

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	3 cr
Languages	German
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LAB, language 100%
Responsible person	Pirjo Rantonen, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs) Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction Fields of education (Ministry of Education and Culture), Social sciences

Prerequisites

EN: Details available in Completion methods under the header Teaching

Learning outcomes

EN: The students will - understand slow and clear speech related to course topics - are able to communicate orally and in writing in simple everyday situations, such as telling about the family, free time and health - are able to use the most frequent basic structures. CEFR level A1

Study materials

EN: Details available in Completion methods under the header Teaching

Completion method and assessment items	Recurrence	Credits
Method 1		3 cr
¤LAB/LUT: Course Completion		3 cr

KD00CH41 German 3

KD00CH41 Saksa 3

Abbreviation: KD00CH41

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	3 cr
Languages	German
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LAB, language 100%

Responsible person	Pirjo Rantonen, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs) Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction Fields of education (Ministry of Education and Culture), Social sciences

Prerequisites

EN: Details available in Completion methods under the header Teaching

Learning outcomes

EN: The students will - understand clear speech related to course topics - are able to communicate orally and in writing in simple everyday situations, such as telling about the home, work and past events - are able to use the most frequent basic structures CEFR level A1

Study materials

EN: Details available in Completion methods under the header Teaching

Completion method and assessment items	Recurrence	Credits
Method 1		3 cr
¤LAB/LUT: Course Completion		3 cr

KD00CH42 German for Work 1

KD00CH42 Työelämän saksaa 1

Abbreviation: KD00CH42

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	3 cr
Languages	German
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LAB, language 100%
Responsible person	Pirjo Rantonen, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs) Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction Fields of education (Ministry of Education and Culture), Social sciences

Prerequisites

EN: Details available in Completion methods under the header Teaching

Learning outcomes

EN: The students will - understand speech and texts related to occupations, work and job search - are able to tell about themselves and their skills - are able communicate in basic situations related to job search CEFR level A2

Study materials

EN: Details available in Completion methods under the header Teaching

Completion method and assessment items	Recurrence	Credits
Method 1		3 cr
¤LAB/LUT: Course Completion		3 cr

KD00CT54 German for Work 3

KD00CT54 Työelämän saksaa 3

Abbreviation: KD00CT54

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	3 cr
Languages	German
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LAB, language 100%
Responsible person	Pirjo Rantonen, Responsible teacher
Study level	Other studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs) Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction Fields of education (Ministry of Education and Culture), Social sciences

Prerequisites

EN: Details available in Completion methods under the header Teaching

Learning outcomes

EN: The student is able to communicate in oral interaction situations at the workplace related to e.g. company visits. The student is able to compose work-related emails. The student knows the key features of German working life.

Study materials

EN: Details available in Completion methods under the header Teaching

Completion method and assessment items	Recurrence	Credits
Method 1		3 cr
¤LAB/LUT: Course Completion		3 cr

KD00BX51 Business German

KD00BX51 Wirtschaftsdeutsch

Abbreviation: KD00BX51

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	3 cr
Languages	German
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LAB, language 100%
Responsible person	Pirjo Rantonen, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs) Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction Fields of education (Ministry of Education and Culture), Social sciences

Prerequisites

EN: Details available in Completion methods under the header Teaching

Learning outcomes

EN: Proficiency level: B1 The student is able to tell in German about a company, its activities and corporate finances

Additional information

EN:

Study materials

EN: Details available in Completion methods under the header Teaching

Completion method and assessment items	Recurrence	Credits
Method 1		3 cr
¤LAB/LUT: Course Completion		3 cr

KD00CZ29 Speaking Skills in German

KD00CZ29 Saksan suullinen kielitaito

Abbreviation: KD00CZ29

Curriculum period	2024-2025

Validity period	since 1 Aug 2024
Credits	3 cr
Languages	German
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LAB, language 100%
Responsible person	Pirjo Rantonen, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs) Fields of education (Ministry of Education and Culture), Social sciences

Completion method and assessment items	Recurrence	Credits
Method 1		3 cr
¤LAB/LUT: Course Completion		3 cr

KF00CH30 French 1

KF00CH30 Ranska 1

Abbreviation: KF00CH30

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	3 cr
Languages	French
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LAB, language 100%
Responsible person	Sari Pärssinen, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs) Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction Fields of education (Ministry of Education and Culture), Social sciences

Prerequisites

EN: Details available in Completion methods under the header Teaching

Learning outcomes

EN: After completing the course, the student - is able to use the basic structures and vocabulary necessary for work and study life introductory situations - can present oneself and tell about oneself orally and in writing. - knows the basic rules of pronunciation - knows the basic differences between formal and informal communication - is able to ask questions and express preferences. - knows the basic structures: verbs' present tense, articles, prepositions of place, prepositions à ja de, personal pronouns, structure expressing ownership, prohibition, questions, numbers 0-69. Proficiency level: A1

Additional information

EN:

Study materials

EN: Details available in Completion methods under the header Teaching

Completion method and assessment items	Recurrence	Credits
Method 1		3 cr
¤LAB/LUT: Course Completion		3 cr

KF00CH31 French 2

KF00CH31 Ranska 2

Abbreviation: KF00CH31

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	3 cr
Languages	French
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LAB, language 100%
Responsible person	Sari Pärssinen, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs) Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction Fields of education (Ministry of Education and Culture), Social sciences

Prerequisites

EN: Details available in Completion methods under the header Teaching

Learning outcomes

EN: After completing the course, the student - is able to use the basic structures and vocabulary necessary in work and study life situations, and to tell about his/her use of time and daily routines. - Communicate in travel situations, - tell about working / study day routines - tell time, announce plans - communicate by phone and email. - knows the basic structures: articles, question words, demonstrative adjectives and pronouns, prepositions à, de, en, present tense, reflexive verbs, near future, numbers 70-1000. Proficiency level: A1

Study materials

EN: Details available in Completion methods under the header Teaching

Completion method and assessment items	Recurrence	Credits
Method 1		3 cr
¤LAB/LUT: Course Completion		3 cr

KF00CH32 French 3

KF00CH32 Ranska 3

Abbreviation: KF00CH32

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	3 cr
Languages	French
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LAB, language 100%
Responsible person	Sari Pärssinen, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs) Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction Fields of education (Ministry of Education and Culture), Social sciences

Prerequisites

EN: Details available in Completion methods under the header Teaching

Learning outcomes

EN: After completing the course, the student - is able to use the basic structures and vocabulary needed in work and study life situations - can tell about eating habits and order in a restaurant - is able to tell about past events, describe the appearance of people and things and compare things, - knows the difference between the formal and informal communication - knows the structures: articles, adjectives, comparison of adjectives, prepositions, personal pronouns, present, passé composé, partitive, quantitative expressions, numerals 1000 -, ordinal numbers Proficiency level: A1

Study materials

EN: Details available in Completion methods under the header Teaching

Completion method and assessment items	Recurrence	Credits
Method 1		3 cr
¤LAB/LUT: Course Completion		3 cr

KF00CG43 French for Work 1

KF00CG43 Työelämän ranskaa 1

Abbreviation: KF00CG43

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	3 cr
Languages	French
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LAB, language 100%
Responsible person	Sari Pärssinen, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs) Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction Fields of education (Ministry of Education and Culture), Social sciences

Prerequisites

EN: Details available in Completion methods under the header Teaching

Learning outcomes

EN: After the course the student - is able to use the structures and the vocabulary needed in working interaction situations - tell about the jobs and about the working environment - is able to present the basic activities of an enterprise and describe the activities of an organization - can write formal messages - can write a CV - knows how to tell about the future and past events - knows the structures: the pronouns, the present, the imperfect tense and the future form. Proficiency level: A2

Study materials

EN: Details available in Completion methods under the header Teaching

Completion method and assessment items	Recurrence	Credits
Method 1		3 cr
¤LAB/LUT: Course Completion		3 cr

KF00CG44 French for Work 2

KF00CG44 Työelämän ranskaa 2

Abbreviation: KF00CG44

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	3 cr
Languages	French
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT

Responsible organisation	LAB, language 100%
Responsible person	Sari Pärssinen, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs) Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction Fields of education (Ministry of Education and Culture), Social sciences

Prerequisites

EN: Details available in Completion methods under the header Teaching

Learning outcomes

EN: After completing the course, the student - is able to use the structures and vocabulary necessary in the most important communication situations of working life, mainly written. - is able to present optionally e.g. company / organization and products, give an elevator speech, tell about entrepreneurship, write a memo. - is able to use subjunctive and conditional Proficiency level: A2

Study materials

EN: Details available in Completion methods under the header Teaching

Completion method and assessment items	Recurrence	Credits
Method 1		3 cr
¤LAB/LUT: Course Completion		3 cr

KP00CK94 Spanish 1

KP00CK94 Espanja 1

Abbreviation: KP00CK94

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	3 cr
Languages	Spanish
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LAB, language 100%
Responsible person	Sari Pärssinen, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs) Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction Fields of education (Ministry of Education and Culture), Social sciences

Prerequisites

EN: Details available in Completion methods under the header Teaching

Learning outcomes

EN: After the course the student is able to - use the structures and the vocabulary needed while presenting oneself in working and studying situations - can present himself and tell about himself in spoken and written way - knows the basic rules of pronunciation - knows the basic differences of the formal and the informal communication - is able to ask questions and tell opinions. - knows the basic structures: the Present Tense, the articles, the prepositions, the personal pronouns, the structures that indicates the possession, the negation, the interrogative sentence, the numbers 0-100 Proficiency level: A1

Additional information

EN:

Study materials

EN: Details available in Completion methods under the header Teaching

Completion method and assessment items	Recurrence	Credits
Method 1		3 cr
¤LAB/LUT: Course Completion		3 cr

KP00CH26 Spanish 2

KP00CH26 Espanja 2

Abbreviation: KP00CH26

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	3 cr
Languages	Spanish
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LAB, language 100%
Responsible person	Sari Pärssinen, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs) Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction Fields of education (Ministry of Education and Culture), Social sciences

Prerequisites

EN: Details available in Completion methods under the header Teaching

Learning outcomes

EN: After the course the student - is able to use the structures and the vocabulary needed in working, studying and leisure everyday situations - tell about his/her daily routines (about the family, describing persons, the hobbies, going to the restaurant and shopping, writing an e-mail message) - knows the ba-

sic structures: articles, questions words, demonstrative adjectives and pronouns, prepositions, the Present Tense, The Perfect Tense, The near Future, the numbers 100-1000 Proficiency level: A1

Study materials

EN: Details available in Completion methods under the header Teaching

Completion method and assessment items	Recurrence	Credits
Method 1		3 cr
¤LAB/LUT: Course Completion		3 cr

KP00CH27 Spanish 3

KP00CH27 Espanja 3

Abbreviation: KP00CH27

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	3 cr
Languages	Spanish
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LAB, language 100%
Responsible person	Sari Pärssinen, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs) Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction Fields of education (Ministry of Education and Culture), Social sciences

Prerequisites

EN: Details available in Completion methods under the header Teaching

Learning outcomes

EN: After the course the student - is able to use tell about the living, to describe the appearance of persons and things, to compare things - can tell about the past events - knows the structures: adjectives, the comparison, the direct and indirect object pronouns, the reflexive verbs, the gerund, the numbers 1000 -, the ordinary numbers Proficiency level: A1

Study materials

EN: Details available in Completion methods under the header Teaching

Completion method and assessment items	Recurrence	Credits
Method 1		3 cr
¤LAB/LUT: Course Completion		3 cr

KP00BX61 Spanish for Working Life 1

KP00BX61 Työelämän espanjaa 1

Abbreviation: KP00BX61

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	3 cr
Languages	Finnish
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LAB, language 100%
Responsible person	Jonna Holkeri, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs) Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction Fields of education (Ministry of Education and Culture), Social sciences

Prerequisites

EN: Details available in Completion methods under the header Teaching

Learning outcomes

EN: After the course the student - is able to use the structures and the vocabulary needed in working interaction situations - tell about the jobs and about the working environment and present the basic activities of an enterprise - can write formal messages - can write a CV - knows how to tell about the future and past events - knows the structures: the pronouns, the present tense, the imperfect tenses, the future, the polite requests (the imperative) Proficiency level: A2

Additional information

EN:

Study materials

EN: Details available in Completion methods under the header Teaching

Completion method and assessment items	Recurrence	Credits
Method 1		3 cr
¤LAB/LUT: Course Completion		3 cr

KP00BX62 Spanish for Working Life 2

KP00BX62 Työelämän espanjaa 2

Abbreviation: KP00BX62

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	3 cr

Languages	Finnish
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LAB, language 100%
Responsible person	Sari Pärssinen, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs) Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction Fields of education (Ministry of Education and Culture), Social sciences

Prerequisites

EN: Details available in Completion methods under the header Teaching

Learning outcomes

EN: After compliting the course, student - is able to communicate mainly written in Spanish in basic business situations and understand the business culture of the Spanish speaking countries. - is able to tell according to choise about, business culture, business communication, meetings, banking, applying for a job in the Spanish speaking world. - is able to use conditional, subjunctive and future. Proficiency level: A2

Additional information

EN:

Study materials

EN: Details available in Completion methods under the header Teaching

Completion method and assessment items	Recurrence	Credits
Method 1		3 cr
¤LAB/LUT: Course Completion		3 cr

KC00CQ66 Basic Chinese 1

KC00CQ66 Basic Chinese 1

Abbreviation: KC00CQ66

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	5 cr
Languages	Chinese
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LAB, language 100%
Responsible person	Ritva Kosonen, Responsible teacher
Study level	Basic studies

Study field	Fields of education (Ministry of Education and Culture), Business, administration and law Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs) Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction Fields of education (Ministry of Education and Culture), Social sciences

Prerequisites

EN: Details available in Completion methods under the header Teaching

Learning outcomes

EN: The students are able to • Achieve a Chinese proficiency of New HSK Level 1; • Master the basic pronunciation rules, vocabulary and grammar of Chinese as well as basic information about Chinese characters; • Acquire preliminary listening, speaking, reading and writing skills; • Make simple conversations about everyday topics in Chinese. • Handle some of the communication tasks when they travel to China; • Analyze and evaluate cultural representations in historical and disciplinary contexts, with the understanding that standards of evaluation are themselves historically produced and contingent. • Reach an upper elementary level in Chinese proficiency, which is approximately equivalent to Level A1 in the Common European Framework of Reference for Languages.

Additional information

EN: Lectured first time in academic year 2022-2023

Study materials

EN: Details available in Completion methods under the header Teaching

Completion method and assessment items	Recurrence	Credits
Method 1		5 cr
¤LAB/LUT: Course Completion		5 cr

KC00CQ68 Intermediate Chinese 1

KC00CQ68 Intermediate Chinese 1

Abbreviation: KC00CQ68

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	3 cr
Languages	Chinese
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LAB, language 100%
Responsible persons	Ritva Kosonen, Responsible teacher ⚠ [information missing], Responsible teacher ⚠ [information missing], Responsible teacher
Study level	Basic studies

Study field	Fields of education (Ministry of Education and Culture), Social sciences Fields of education (Ministry of Education and Culture), Business, administration and law Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs) Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Prerequisites

EN: Details available in Completion methods under the header Teaching

Learning outcomes

EN: Upon completion of the course, students will be able to: • Pass the New HSK Level 4 test and prepare for Level 3; • Further improve listening, reading, speaking and writing skills; • Understand basic language materials that they encounter in their daily life, work and other common social occasions in Chinese without Pinyin and be able to write down sentences in Chinese characters; • Communicate and exchange ideas with others on familiar topics and to describe briefly basic situations relevant to these topics; • Reach an intermediate level in Chinese proficiency, which is approximately equivalent to Level B1 in the Common European Framework of Reference for Languages.

Additional information

EN: Lectured first time in academic year 2023-2024

Study materials

EN: Details available in Completion methods under the header Teaching

Completion method and assessment items	Recurrence	Credits
Method 1		3 cr
¤LAB/LUT: Course Completion		3 cr

KM00BX75 Each one teach one

KM00BX75 Each one teach one

Abbreviation: KM00BX75

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	3 cr
Languages	English
Grading scale	Pass-Fail
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LAB, language 100%
Responsible person	Aria Kanerva, Responsible teacher
Study level	Basic studies

Study field	Fields of education (Ministry of Education and Culture), Business, administration and law Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs) Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction Fields of education (Ministry of Education and Culture), Social sciences

Prerequisites

EN: Details available in Completion methods under the header Teaching

Learning outcomes

EN: Proficiency level: any between A1-C2 Students learn a language of their choice together with a native speaker.

Study materials

EN: Details available in Completion methods under the header Teaching

Completion method and assessment items	Recurrence	Credits
Method 1		3 cr
¤LAB/LUT: Course Completion		3 cr

KE00CH94 Diversity Management and Global Citizenship

KE00CH94 Diversity Management and Global Citizenship

Abbreviation: KE00CH94

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	5 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LAB, language 100%
Responsible person	Jaana Häkli, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs) Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction Fields of education (Ministry of Education and Culture), Social sciences

Prerequisites

EN: Details available in Completion methods under the header Teaching

Learning outcomes

EN: The student is able to: - understand different concepts of diversity and inclusion in the workplace and their impact on organizations - understand cultural differences in management and leadership - recognize the benefits of managing diversity in organizations - lead diverse individuals and teams - understand global impacts of their own actions and the importance of a global mindset in today's world.

Study materials

EN: Details available in Completion methods under the header Teaching

Completion method and assessment items	Recurrence	Credits
Method 1		5 cr
¤LAB/LUT: Course Completion		5 cr

KE00CF69 Intercultural Competence and Communication

KE00CF69 Intercultural Competence and Communication

Abbreviation: KE00CF69

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	5 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LAB, language 100%
Responsible person	Derek Mitchell, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs) Fields of education (Ministry of Education and Culture), Social sciences

Completion method and assessment items	Recurrence	Credits
Method 1		5 cr
¤LAB/LUT: Course Completion		5 cr

A380A0320 Applied Consumer Behaviour

A380A0320 Applied Consumer Behaviour

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	6 cr
Languages	English
Grading scale	General scale, 0-5

University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LBS, Business Administration 100%
Responsible persons	Jenni Sipilä, Responsible teacher Suvi Tiainen, Administrative person
Study level	Intermediate studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law

Tweet text

EN: Location: Lappeenranta

Prerequisites

EN: Basics of marketing (Markkinoinnin perusteet).

Learning outcomes

EN: After taking the course, the students are able to:
· Search and synthesize academic literature and theoretical frameworks pertaining to consumer behavior.

· Develop research questions and hypotheses based on academic literature on consumer behavior.

· Identify the most suitable research methods to address specific research questions related to consumer behavior.

· Collect and analyze qualitative and quantitative consumer data.

· Interpret the results of a research project and reflect on their academic and practical implications.

· Work effectively and systematically on a research project.

· Understand and apply the principles of academic writing to their own research reports.

· Present the results of a research project effectively to a professional audience.

Content

EN: This course provides an overview of consumer behavior as a field of research and practical skills related to consumer data collection and analysis. During the course, students will learn different methods of collecting consumer data along with practical methods of analyzing this data and interpreting results. The key contents are:
The process of conducting a systematic literature review in the field of consumer behavior. Basics of critical reading and synthesis of academic literature. Key theoretical frameworks and their applications in the field of consumer behavior. The process of developing research questions and hypotheses pertaining to consumer behavior.

Basics of qualitative and quantitative research methods in the field of consumer behavior. The process of collecting and analyzing qualitative consumer data (interviews). The process of collecting and analyzing quantitative consumer data (experiments).

Basics of academic writing and reporting of research results. The process of working on a consumer research project as a team. The process of preparing and conducting a presentation of a consumer research project to a professional audience.

Additional information

EN: The teaching is arranged in a blended format. The lectures take place in Lappeenranta and they are live-streamed and recorded. The seminars and final presentations require physical presence in Lappeenranta.
***

The course is related to UN's Sustainable Development Goals (SDG): 12 responsible consumption and production.

Study materials

EN: The reading and study materials will be distributed via Moodle.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	6 cr
Course Completion		6 cr

A130A0620 Basics in MS Excel for Business Students

A130A0620 Basics in MS Excel for Business Students

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	3 cr
Languages	English
Grading scale	Pass-Fail
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LBS, Business Administration 100%
Responsible persons	Sanna Heinänen, Responsible teacher Suvi Tiainen, Administrative person
Study level	Intermediate studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law

Tweet text

EN: Location: full digi

Prerequisites

EN: No preliminary studies required. Basic knowledge of MS Excel recommended.

Learning outcomes

EN: By the end of the course, students are able to use and develop basic functions for data analysis relating to business studies and needs.

Content

EN: The course is based on independent study and can be carried out any time during the academic year. During the course, students are learning the basics of MS Excel for business studies. The course includes self-learning videos and documents as well as web-based exercises. The topics include formatting, drawing graphs, basic mathematic formulas, lookup formulas and working with pivot tables and dashboard. The course does not require preliminary studies. The basic knowledge of MS Excel recommended.

Study materials

EN: Course materials

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-Summer	3 cr
Course Completion		3 cr
Method 2	Recurrence 1: 1. period-Summer	3 cr
Course Completion		3 cr

A380A0131 Business Relationships in International Value Networks

A380A0131 Business Relationships in International Value Networks

Abbreviation: A300CE15

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	6 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LBS, Business Administration 100%
Responsible persons	Sirpa Multaharju, Responsible teacher Axel Zehendner, Responsible teacher Suvi Tiainen, Administrative person
Study level	Intermediate studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law

Tweet text

EN: Location: full digi

Prerequisites

EN: B.Sc. (Econ. ; Bus. Adm.) General studies

Learning outcomes

EN: The aim of the course is to familiarize students with different business relationships in international value networks, management of relationships and networks, and characteristics of supplier relationships and collaborative networks.
Upon completion the course students are able to

- understand the main concepts and theoretical backgrounds of collaboration and networks

- analyze the benefits and challenges of relationships and networks

- define supplier relationships

- participate in the development of supplier supplier relationships.

Content

EN: - The concepts and theories of collaboration and networking
- The benefits and challenges of collaboration

- Management of collaboration and networks, and supplier relationship management

Additional information

EN: Course is available for following students:

- LUT Business School students
- exchange students in business studies
- LAB business degree students
- Engineering students with a minor in business studies

The course is organized two times in an academic year: period 2 and period 4.

Moodle-based online course.

No contact teaching: so the course does not exist in TimeEdit /timetable) The teacher contacts the students every week via Moodle messages.

NB! After being accepted to the BRIVN course especially exchange students must make sure that they use LUT email and can receive Moodle messages, which is essential for completing the course.

Please be informed that if you miss the deadline for enrolling a group for the case assignment in Moodle, you cannot continue the course. The enrolling period is one week from the beginning of the course.

***

The course is related to UN's Sustainable Development Goals (SDG): 17 partnership for the goals.

Study materials

EN: Selection of journal articles and assigned readings, teaching videos and presentations.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 2. period Recurrence 2: 4. period	6 cr
¤LAB/LUT: Course Completion		6 cr
Method 2	Recurrence 1: 2. period, 4. period	6 cr
¤LAB/LUT: Course Completion		6 cr

A240A0010 Introduction to Programmatic Business Analytics

A240A0010 Introduction to Programmatic Business Analytics

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	6 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LBS, Business Administration 100%
Responsible persons	Jan Stoklasa, Responsible teacher Shahid Bhat, Responsible teacher Mostafa Goudarzi, Responsible teacher
Study level	Intermediate studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law

Tweet text

EN: Location: Lappeenranta

Prerequisites

EN: A130A0350 Kvantitatiiviset tutkimusmenetelmät (Quantitative Research Methods).

Learning outcomes

EN: The course introduces business students to the core programming (i.e., Python or R) languages used in modern business analytics. Specifically, after completing the course, the student will:
1. Understand the big picture of how programmatic business analytics works from the start to the end, and understand the value of data analytics in facilitating evidence-based business decision-making.

2. Know how to implement a simple, but complete data analysis process with Python or R(for example):

a. Gather raw data from primary databases and secondary data sources such as websites (the basics of APIs and web scraping).

b. Clean and combine the raw data into an analyzable format (data wrangling/munging).

c. Run basic statistical analyses (e.g., linear regression) and visualize the analysis results.

d. Build basic predictive models for automated decision-making (i.e., an introduction to machine learning and its applications in business).

Content

EN: Basics of programming and algorithmic thinking in programming languages used in practical business analytics (Python or R), and their application in business analytics, including a recap on basic statistics (e.g., linear regression) and an introduction to machine learning algorithms. The focus is heavily on hands-on learning (i.e., actual programming) and on examining business-related problems with real world data.

Additional information

EN: Full digi
Other additional information

***

The course is related to UN's Sustainable Development Goals (SDG): 4 quality education

Study materials

EN: Lecture slides and other presented material.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	6 cr
Course Completion		6 cr

A320A0011 Introduction to International Entrepreneurship

A320A0011 Introduction to International Entrepreneurship

Abbreviation: IIE

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	6 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LBS, Business Administration 100%
Responsible persons	Ekaterina Albats, Responsible teacher Hannes Velt, Responsible teacher Tommi Rissanen, Responsible teacher Sanne Bor, Responsible teacher Suvi Tiainen, Administrative person
Study level	Intermediate studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law

Tweet text

EN: Location: Lappeenranta

Prerequisites

EN: Recommended, but not required: A370A0001 Johtamisen ja yrittäjyyden perusteet; A370A0401 Case-Course of Business; A380A6050 Introduction to International Business and Planning; A130A0550 Introduction to Organizational Behavior

Learning outcomes

EN: After completing the course, students will be able to:
1. describe the phenomenon of international entrepreneurship from theoretical and practical viewpoint

2. characterise entrepreneurial/startup culture

3. describe, evaluate and reproduce the process of international entrepreneurship (startup internationalisation process including opportunity recognition, innovation and value creation, value delivery and value capture/opportunity exploitation) in a variety of contexts

4. understand and assess challenges of international entrepreneurship in a variety of international contexts

5. evaluate, compare and select in a justified manner different internationalisation strategies for new ventures in a variety of contexts

6. demonstrate competences in using tools, primary and/or secondary data sources for strategic analysis and management of a new venture

7. able to create a business development plan and its presentation for a corporate audience with a focus on growth and internationalisation

8. discuss and self-reflect on the role of different personal skills and organisational capabilities in new venture creation and new venture management

9. collaborate in a cross-cultural team.

Content

EN: Are you considering an entrepreneurial career, work in a small, agile and rapidly growing firm or do you want to develop entrepreneurial and intrapreneurial skills? In all these cases, this course is for you! Despite the rising popularity of entrepreneurship, several challenges await every start-up already at the stages of product/service development, proof of concept and prototyping. Furthermore, multiple managerial issues constantly emerge - dealing with limited resources and fierce competition, a need to build external relations being a small firm, a need in a constant change and agility along with a mission to grow rapidly and internationally. Large firms, as employers, in turn, seek for curious candidates with intrapreneurial mindset - self-motivated, proactive, and action-oriented people who take the initiative to pursue an innovative and international product, service or project.
The course is designed in a way that every student gets a chance to understand the fundamentals of international entrepreneurship, gets a deep dive into the challenges of a start-up using a case study and to develop and test own skills in solving the case specific challenge. The students form teams to solve a complex new venture challenge of their choice. The course encourages a combination of theoretical and practical approaches to building a comprehensive understanding of international entrepreneurship. In addition to a group work on challenge solution, the course also has two individual assignments: a self-reflection assignment and an individual essay-based electronic exam.

Additional information

EN: Please note: the students who have taken A210A0702 New Venture Management cannot take this course.
The course is related to UN's Sustainable Development Goals (SDG): 8 decent work and economic growth, 9 industry, innovation and infrastucture, 17 partnership for the goals

Study materials

EN:

- Main Textbook: Hisrich, R., Peters, M. and Shepherd, D. (2023) Entrepreneurship 12th Edition. McGrawHill.
- Lecture materials
- The additional reading materials from academic and business press articles (i.e., case and journal articles) will be distributed during the course.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	6 cr
Course Completion		6 cr

A380A7001 Introduction to International Business

A380A7001 Introduction to International Business

Abbreviation: IIB

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	6 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LBS, Business Administration 100%
Responsible persons	Igor Laine, Responsible teacher Juha Väätänen, Responsible teacher Suvi Tiainen, Administrative person
Study level	Intermediate studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law

Tweet text

EN: Location: Lappeenranta

Equivalences to other studies

CS10A0262 International Business Essentials

Learning outcomes

EN: After successful completion of the course, students should be able to:
1. understand the notion and key concepts of international business
2. describe and discuss major theories of international business
3. identify and evaluate strategy and competitiveness in international business
4. understand and justify major decisions in international business, including decisions on market selection and entry modes
5. discuss challenges of managing multinational enterprises

Content

EN: International business theories. International competitiveness. Regional economic integration. International business strategy. Market selection and entry modes in international business. Managing multinational enterprise. International Entrepreneurship.

Additional information

EN: Contact teaching at the Lappeenranta campus. In case of reaching the maximum number of spots in the course, priority will be given to students of LBS.
***

The course is related to UN's Sustainable Development Goals (SDG): 8 decent work and economic growth, 9 industry, innovation and infrastructure, 12 responsible consumption and production, 16 peace, justice and strong institutions, 17 partnership for the goals

Study materials

EN: Cavusgil S.T., Knight G., Reisenberger J., 2024, International Business: The New Realities (6th edition), Harlow, UK: Pearson Education Ltd.
Hollensen S. 2020 Global Marketing (8th edition), Harlow, UK: Pearson Education Ltd.

Additional materials will be announced in class and in Moodle.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period	6 cr
Course Completion		6 cr

A130A0670 Mathematics for Economics

A130A0670 Mathematics for Economics

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	6 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LBS, Business Administration 100%
Responsible persons	Olli-Pekka Hämäläinen, Responsible teacher Suvi Tiainen, Administrative person
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law

Learning outcomes

EN: After taking the course, the students should be able to:
- Estimate elemental probabilities

- Solve basic equations (polynomial, exponential, logarithmic)

- Analyze the behavior of elemental functions using equations and differential & integral calculus

- Perform basic matrix calculations and solve systems of linear equations using matrices

- Model and analyze cost, revenue and profit with functions

- Solve simple 2-variable linear optimization problems

- Understand arithmetic and geometric series & their connection with loan and investment calculations as well as perform these calculations using different interest rates.

Content

EN: Probability theory, equation solving, functions and function behavior analysis, differentiation, integration. Linear algebra, matrix calculations, Gaussian elimination. Functions in business (cost, revenue, profit), financial applications of differential and integral calculus, graphical method of linear optimization. Arithmetic and geometric series, loan and investing calculations.

Additional information

EN: Course is only available for students who are stydying in Bachelor's Programme in Sustainable International Business.

Study materials

EN: Lecture materials in Moodle.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	6 cr
Course completion		6 cr

A250A0620 Fundamentals of Accounting and Finance

A250A0620 Fundamentals of Accounting and Finance

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	6 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LBS, Business Administration 100%
Responsible persons	Henri Huovinen, Responsible teacher Suvi Tiainen, Administrative person
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law

Tweet text

EN: Location: Online

Learning outcomes

EN: Upon completing this course, students will achieve the following learning outcomes:
- Establish a solid foundation in financial and management accounting, complemented by an introduction to corporate finance principles.

- Grasp critical concepts including financial statement analysis, cost accounting, and the fundamentals of budgeting.

- Delve into key areas of corporate finance, gaining insights into its essential components.

- Enhance their ability to analyze financial information with precision and confidence.

- Equip themselves with the knowledge to make well-informed preliminary financial decisions.

- Understand and value the significant impact of finance on the development and execution of effective business strategies.

Content

EN: The course structure comprises the following topics: basic principles of financial and management accounting concepts; structure and analysis of financial statements; basics of cost accounting and budgeting; fundamentals of corporate finance; valuation of future cash flows; payout policy and capital structure; concepts of risk and return; short-term finance and working capital management; and cost of capital and long-term financial policy.

Study materials

EN: Lecture notes and recommended literature.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 2. period	6 cr
Course completion		6 cr

A380A7010 Principles of Management and Leadership

A380A7010 Principles of Management and Leadership

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	6 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LBS, Business Administration 100%
Responsible persons	Kirsimarja Blomqvist, Responsible teacher Kateryna Kryzhanivska, Responsible teacher Suvi Tiainen, Administrative person
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law

Learning outcomes

EN: The course empowers students with the skills to make meaningful changes in the world by leading and managing organizations. Students will learn

1. to demonstrate an understanding of management functions: planning, organizing, leading, and controlling, as well as leadership styles,
2. to describe and apply concepts, theories, and practices relevant to exercising management and leadership in modern organizations,
3. to demonstrate ethical, sustainable, and socially responsible decision-making and management practices,
4. collectively map organizational management and leadership challenges, and
5. co-create solutions to manage these challenges effectively and efficiently.

Content

EN: The course focuses on planning, organizing, leading, and controlling, management theories, managerial roles, and leadership styles. The topics are discussed in a global context, requiring an ethical and sustainable approach to management and leadership.

Additional information

EN: The course is part of the UN's Sustainable Development Goals (SDG): 8,9 and 17.

Study materials

EN:

- Kinicki, A., & Williams, B. K. (2022). Management: A practical introduction. McGraw-Hill.
- Lecture slides
- Additional materials are distributed in class and Moodl

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 2. period	6 cr
Course completion		6 cr

A380A0270 Introduction to International Marketing and Purchasing

A380A0270 Introduction to International Marketing and Purchasing

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	6 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LBS, Business Administration 100%
Responsible persons	Liisa-Maija Sainio, Responsible teacher Katrina Lintukangas, Responsible teacher Suvi Tiainen, Administrative person
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law

Tweet text

EN: Opetuspaikka: Lappeenranta

Learning outcomes

EN: The aim of the course is to develop students' capabilities and understanding of the basics and strategies of marketing and purchasing in an international context, including sustainability aspects. The students will gain an understanding of the connections between marketing and procurement in company operations and are able to analyze the characteristics of the international business environment and different cultures in marketing and procurement management.
After completing the course, students should be able to:

1. understand and apply knowledge to management of marketing and purchasing issues in international environment

2. analyze the characteristics of international and intercultural marketing and purchasing

3. design purchasing strategies and use marketing mix tools in international context

4. comprehend sustainability considerations in marketing and purchasing

5. collaborate in teams to facilitate communication, engage in discussions, and collectively reach group decisions

Content

EN: Opportunities and challenges in international marketing and purchasing operations. The interconnectedness of marketing and purchasing in a company’s operations. Sustainability considerations in marketing and procurement management in international context. Marketing mix tools and purchasing strategy development tools.

Additional information

EN: The course is related to UN's Sustainable Development Goals (SDG): responsible consumption and production

Study materials

EN: Lecture materials, other course material will be announced in the beginning of the course.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 2. period	6 cr
Course completion		6 cr

BM20A7102 Statistics II

BM20A7102 Tilastomatematiikka II

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	4 cr
Languages	Finnish
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Computational Engineering 100%
Responsible persons	Jonna Naukkarinen, Administrative person Tarja Pettinen, Administrative person Jarkko Suuronen, Responsible teacher
Study level	Intermediate studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta

Prerequisites

EN: Required: Basic on Matlab programming, BM20A1401 Statistics I or equivalent knowledge.

Compulsory prerequisites

BM20A8601 Statistics I

Learning outcomes

EN: The student expands his/her knowledge statistical methods, is able to formulate models and apply these methods to various areas in technology, economics and science. The student is able to perform two-sample tests, analysis of variance, analyze time series data. The student understands multivariate distributions and knows basics of factor analysis.

Content

EN: Statistical inference: distribution testing, hypothesis testing, two or multiple sample tests. Paired tests. Nonparametric tests. Basics of analysis of variance, time series analysis and multiple regression models. Introduction to nonlinear regression. Introduction to factor analysis.

Study materials

EN: Anthony J. Hayter, "Probability and Statistics for Engineers and Scientists"

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 4. period	4 cr

Course Enrolment		0 cr
Course Assessment		4 cr
Method 2	Recurrence 1: 4. period	4 cr
Course Assessment, in English		4 cr
Course Enrolment, in English		0 cr

BM20A8901 Primer to Numerical Programming

BM20A8901 Primer to Numerical Programming

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	4 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Computational Engineering 100%
Responsible persons	Jonna Naukkarinen, Administrative person Tarja Pettinen, Administrative person Lassi Roininen, Responsible teacher Juho Virpiranta, Responsible teacher
Study level	Other studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta, kokonaan verkossa / full digi

Prerequisites

EN: Basic university calculus required. Recommended first year university calculus necessarily including matrix calculus.

Equivalences to other studies

BM20A5002 Principles of Technical Computing

Learning outcomes

EN: Upon completion of the course students:
- get a good understanding of Matlab syntax and programming,

- gain fluency in principles of technical computing, converting tasks into basic algorithms

- are able to apply the skills to basic mathematical and engineering problems (the skills are applicable in big part to Octave and R programming, too).

Content

EN: Working with various data structures (multidimensional arrays, cell arrays, etc.) and variable types (numeric, logical, textual, etc.), Matlab symbolic functionality, conditional statements (if-else, switch-case), loops (for and while), using built-in functions, handling external data, 2-D and 3-D plotting, writing user-defined functions.

Study materials

EN: Lecture material available in Moodle (slides and videos), based partly on textbook: Gilat, A.: An Introduction to Matlab with Applications.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period	4 cr
Course Completion		4 cr

BL10A0102 Basics of Electrical Engineering

BL10A0102 Basics of Electrical Engineering

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	2 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LES, Electrical Engineering 100%
Responsible persons	Minna Loikkanen, Administrative person Pia Lindh, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta

Prerequisites

EN: Not required.

Learning outcomes

EN: Upon completion of the course the student will be able to list the most essential electric supply methods, solve simple DC and AC systems and understands how transformer and generator works. Student should be able to determine the most important end-uses of electricity, explain electricity price formation, identify applications of electrical engineering and understand their operation principles.

Content

EN: The "Basics of Electrical Engineering" course provides a comprehensive understanding of the key concepts, principles, and applications of electrical engineering. The course introduces the basic calculation of electricity with the help of, for example, Ohm's and Kirchhoff's laws. In addition, students become familiar with electromagnetic phenomena, such as electric and magnetic fields, and their interaction. In addition, the course introduces electricity production methods and examines electricity consumption in different sectors, such as industry, services and housing. Students also learn about different types of electric drives, such as different motor types and power electronics. The course also provides an overview of the operation of the Finnish electricity transmission network and the related electricity market. This gives students a holistic view of the basics of electrical engineering and their practical applications.

Additional information

EN: The course is related to UN's Sustainable Development Goals (SDG): 7 affortable and clean energy, 13 climate action, 15 life and land.

Study materials

EN: Course material, e.g. lecture material is in the Moodle learning environment.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period	2 cr
¤LUT/LAB: Course Completion		2 cr
Method 2	Recurrence 1: 1. period-2. period	3 cr
¤LUT/LAB: Course Completion		3 cr

BL20A0710 Introduction to Electrical Power Systems

BL20A0710 Introduction to Electrical Power Systems

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	5 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LES, Electrical Engineering 100%
Responsible persons	Minna Loikkanen, Administrative person Jukka Lassila, Responsible teacher Juha Haakana, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta

Prerequisites

EN: BL10A0100 Basics of Electrical Engineering and BL30A0000 Electric circuits attended.

Equivalences to other studies

BL20A0701 Introduction to Electric Power Systems

Learning outcomes

EN: Upon completion of the course the student will be able to: 1. describe the essential operating principles of an electric power system, i.e., principles of power balance and voltage control management, 2. calculate the voltages, load currents, losses, symmetrical fault currents and costs in electric power systems, 3. describe the basic phenomena and calculation principles related to static and transient stability, 4. describe basics of electricity markets.

Content

EN: Operation of electricity market. Interconnection of electric power systems. Components and their equivalent circuits in electric power systems. Calculation of transmission and distribution networks. An overview of high voltage and equipment technology. Electricity quality factors. Basics of electricity markets.

Additional information

EN: Contact teaching
***

The course is related to UN's Sustainable Development Goals (SDG):

7 affortable and clean energy

Study materials

EN: E-book: Electric power systems by Weedy, Brian B.
Additional material in Moodle.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period	5 cr
Course Assessment		5 cr
Course Enrolment		0 cr
Method 2	Recurrence 1: 1. period	5 cr
Course Assessment		5 cr
Course Enrolment		0 cr

BL30A0510 Introduction to Electrical Drives

BL30A0510 Introduction to Electrical Drives

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	3 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LES, Electrical Engineering 100%
Responsible persons	Minna Loikkanen, Administrative person Lasse Laurila, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta

Prerequisites

EN: Recommended: BL30A0000 Electric Circuits and BL30A0300 Electromagnetism attended.

Recommended prerequisites

BL30A0001 Electric Circuits

BL30A0300 Electromagnetism

Equivalences to other studies

BL30A0500 Introduction to Electrical Drives

Learning outcomes

EN: Upon completion of the course the student will be able to describe the principles of electric motors and frequency converters and recognize terms in the field of electric drives. The student can solve simple calculation problems in the field of electric drives.

Content

EN: Operation of electromechanical and electromagnetic devices, current vector, torque. Basic types and operation principles of rotating electrical machines: general rotating field machine, DC machine, asynchro-

nous machine, synchronous machine, reluctance machine. Energy efficient electric motor drives. Control principles: scalar, vector and direct torque control (DTC). Applications. Electrical energy storages.

Additional information

EN: Note: LES B.Sc. year 2, but in sähkötekniikan kandidaatti TkK 3.Replaces the course BL30A0500 Sähkönkäyttötekniikan perusteet, 3 ECTS, which was lectured last time in 2019-2020.

Study materials

EN: Course material in Moodle.Recommended to follow also additional material listed in Moodle and lecture materials.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period	3 cr
Course Completion		3 cr
Method 2	Recurrence 1: 1. period	3 cr
Course Completion		3 cr

BL40A3010 Introduction to Electrochemical Energy Storage and Conversion Technologies

BL40A3010 Introduction to Electrochemical Energy Storage and Conversion Technologies

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	4 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LES, Electrical Engineering 100%
Responsible persons	Minna Loikkanen, Administrative person Pertti Kauranen, Responsible teacher
Study level	Intermediate studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Recommended prerequisites

BJ01A1011 General and Inorganic Chemistry

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	4 cr
Course Completion		4 cr

BH20A0720 Engineering Thermodynamics

BH20A0720 Engineering Thermodynamics

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	6 cr
Languages	English

Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LES, Energy Technology 100%
Responsible persons	Minna Loikkanen, Administrative person Srujal Shah, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta, Lahti

Learning outcomes

EN: After completing the course students are familiar with basic concepts in energy technology, such as temperature, state properties, systems and processes, control volume analysis, different forms of energy and fundamental laws of thermodynamics. Students are able to use different charts and tables to find thermodynamic properties of different substances. After completing the course students can formulate the equation for the conservation of energy for an open control volume. Students are able to calculate heat, work and entropy change in ideal gas compression. Students understand the working principle of a heat engine and importance of Carnot-efficiency as a limit for the theoretical maximum efficiency of any heat engine. Students can apply fundamental laws and equations of thermodynamics for studying different processes (especially related to energy and environmental technology). Students are able to calculate basic heating and air-conditioning processes. Students understand working principle of heat pump and refrigeration systems and can calculate operational values of such processes. Students understand working principle of different energy conversion processes and can solve simple internal combustion engine, gas turbine and steam power processes.
Completion of the course supports the development of the following generic competences for working life: mathematics and natural sciences, practical application of theories, working independently, problem solving, and time management and prioritizing tasks.

Content

EN: Basic concepts: state, process, system. Thermodynamical properties, ideal and real gas laws. The first law of thermodynamics, concepts, energy, work, heat, internal energy. Expansion and compression work for isothermal, isentropic and polytropic processes. The second law of thermodynamics, Carnot-process, heat engines, isentropic efficiency. Thermoeconomics, exergy. Ideal gas mixtures, heating, ventilation and air-conditioning processes, refrigeration and heat pump systems, energy conversion processes: internal combustion engine, steam power plant, gas turbine process. Course includes Power-to-X themes.

Additional information

EN: Note
Parallel to Course BH20A0750 Engineering Thermodynamics (in Finnish), common exams, mid-term exams and exercises, separate lectures.

The course is related to UN's Sustainable Development Goals (SDG): 7 Affordable and Clean Energy, 9 Industry, Innovation and Infrastructure, 11 Sustainable Cities and Communities, 13 Climate Action

Study materials

EN: Online material on Moodle, 'Thermodynamic tables' handout, enthalpy and entropy chart for steam. The relevant parts of Moran, M.J. ; Shapiro, H.N.: Fundamentals of Engineering Thermodynamics, 5th ed. 2004 or later.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	6 cr

Course Enrolment		0 cr
Course Assessment		6 cr
Method 2	Recurrence 1: 1. period-2. period	6 cr
Midterm-Exam 1		0 cr
Midterm-Exam 2		6 cr
Course Enrolment		0 cr

BH60A7200 Circular.now

BH60A7200 Circular.now

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	3 cr
Languages	English
Grading scale	Pass-Fail
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LES, Environmental Technology 100%
Responsible persons	Sanni Väisänen, Responsible teacher Annukka Ilves, Administrative person
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta, Lahti, kokonaan verkossa / full digi

Learning outcomes

EN: After successfully completing the course, students are able to:
1. explain the targets of circular economy and understand possibilities to implement circular economy in different sectors,
2. understands capability of the selected products, production systems and services to fulfil the requirements of circular economy

Content

EN: Introduction to circular economy: circular economy aspects related to food systems, forest systems, product design, transportation sector and sharing economy.

Additional information

EN: ***The course is related to UN's Sustainable Development Goals (SDG):
7 affortable and clean energy, 9 industry, innovation and infrastructure, 11 sustainable cities and communities, 12 responsible consumption and production, 13 climate action.

NOTE! BH60A7200 Circular.Now and BH60A5401 Introduction to Circular Economy are alternative, both cannot be included in the degree!

Submitted tasks will be evaluated at the end of each period.

Study materials

EN: Circular.Now MOOC material in DigiCampus.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-Summer	3 cr
Course completion		3 cr
Method 2	Recurrence 1: 1. period-Summer	3 cr
Course completion		3 cr

BH60A6801 Sustainable.now

BH60A6801 Sustainable.now

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	3-5 cr
Languages	English, Finnish
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LES, Environmental Technology 100%
Responsible persons	Annukka Ilves, Administrative person Miika Marttila, Responsible teacher
Study level	Intermediate studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: full digi

Learning outcomes

EN: After successfully completing the course, students:
1) Understand the intersectional, partly contradictory, goals and interdimensionality of the climate challenge and the challenges of sustainable development.

2) Are familiar with the multidisciplinary links between climate change and different goals of sustainable development, and will identify different tools for solving problems.

3) Outline the importance of positivity and solution orientation both through the global responsibility of individuals and through the transformation of existing structures.

Content

EN: Sustainable.now is a basic course for anyone interested in sustainable development and climate change. The principles of sustainable development will be linked to the 1.5 degree climate target.
- Ecological sustainability

- Social sustainability

- Economic sustainability

- Cultural sustainability

The course provides a solid knowledge package on the concept of sustainable development and its ecological, social, economic and cultural dimensions, as well as the connections and tensions between them. The ethical perspective that runs through the course provides a basis for considering sustainable development also as a political and normative concept. The course also emphasizes the importance of agency and the different roles of the individual. Students will be given the opportunity to look at the sustainability of their own lifestyle in terms of individual choices, but on the other hand, sustainability and climate challenges will also be presented as a structural and systemic problem.

Additional information

EN: The course is a part of Climate University – a multidisciplinary digital learning platform in sustainability challenges. The flexible study paths to the working life is a collaboration project of eleven Finnish universities.
The student can choose either 3 or 5 credits option upon the need.

The course is related to UN's Sustainable Development Goals (SDG):

1 no poverty

2 zero hunger

3 good health and well-being

4 quality education

5 gender equality

6 clean water and sanitation

7 affortable and clean energy

8 decent work and economic growth

9 industry, innovation and infrastucture

10 recuded inequalities

11 sustainable cities and communities

12 responsible consumption and production

13 climate action

14 life below water

15 life and land

16 peace, justice and strong institutions

17 partnership for the goals

Study materials

EN: Material and Literature specified in MOODLE course overview.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 2. period Recurrence 2: 4. period	6 cr
Course Completion in English		3 cr
Course completion in Finnish		3 cr
Method 2	Recurrence 1: 2. period, 4. period	10 cr
Course completion in English		5 cr
Course completion in Finnish		5 cr
Method 3	Recurrence 1: 2. period, 4. period	3 cr
Course Completion in English		3 cr
Method 4	Recurrence 1: 2. period, 4. period	5 cr
Course completion in English		5 cr

BH60A5401 Introduction to Circular Economy

BH60A5401 Introduction to Circular Economy

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	5 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LES, Environmental Technology 100%
Responsible persons	Sanni Väisänen, Responsible teacher Annukka Ilves, Administrative person Laura Lakanen, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta, Lahti, full digi

Learning outcomes

EN: After completing the course, students will be able to:
1. explain the targets of circular economy and understand possibilities to implement circular economy in different sectors,
2. analyze capability of the selected products, production systems and services to fulfil the requirements of circular economy,
3. implement assessments to reveal development needs of selected products, production systems and services to fulfill the requirements of circular economy, and
4. compare different alternative ways to work towards circular economy targets.

Content

EN: Introduction to circular economy: circular economy aspects related to food systems, forest systems, technical cycles, transportation sector and sharing economy.

Additional information

EN: The course is related to UN's Sustainable Development Goals (SDG): 7 affordable and clean energy, 9 industry, innovation and infrastructure, 11 sustainable cities and communities, 12 responsible consumption and production, 13 climate action

NOTE! BH60A7200 Circular.Now and BH60A5401 Introduction to Circular Economy are alternative, both cannot be included in the degree!

Study materials

EN: DigiCampus Circular.now

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	5 cr
Course completion		5 cr

LES10A020 Engineering Physics

LES10A020 Engineering Physics

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	3 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LUT School of Energy Systems 100%
Responsible persons	Annukka Ilves, Administrative person Minna Loikkanen, Administrative person Aleksi Mankonen, Responsible teacher Paula Immonen, Responsible teacher Ayesha Sadiqa, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta and Lahti

Prerequisites

EN: High school level of Physics and Mathematics

Learning outcomes

EN: After successfully completing the course, students are able to:
1. approach physics problems in a systematic way, connecting physics phenomena to theory, using the SI system and evaluating accuracy.

2. solve simple qualitative and quantitative physics problems related to course contents.

3. communicate and collaborate with peers, verbalise physics knowledge in English, use educational technologies, and develop confidence as a university student.

Content

EN:

1. Electricity and magnetism: electrostatics, direct-current circuits, basics of magnetism, electromagnetic induction
2. Thermal physics: thermodynamic systems and quantities, thermal expansion and heat transfer, phase changes and ideal gas law, laws of thermodynamics, heat engines.
3. Oscillations and waves: periodic and circular motion, harmonic oscillation, harmonic waves, mechanical and electromagnetic waves.

Additional information

EN: The course is related to UN's Sustainable Development Goals (SDG): 4 quality education, 5 gender equality, 8 decent work and economic growth, 9 industry, innovation and infrastructure, 10 reduced inequalities, and 17 partnership for the goals.

Study materials

EN: Course textbooks (online), lecture notes, videos, online exercises.

Literature

Halliday, D., Resnick, R., & Walker, J. (2013). Fundamentals of physics. John Wiley & Sons.

Urone, P. P., & Hinrichs, R. (2012). College Physics (OpenStax).
Moebs, W., Ling, S. J., & Sanny, J. (2016). University Physics Volume 1. Rice University.
Ling, S. J., Sanny, J., Moebs, W., Friedman, G., Druger, S. D., Kolakowska, A., ... & Wheelock, K. (2016). University Physics Volume 2.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	3 cr
Course Completion		3 cr

LES10A200 Engineering Mathematics I

LES10A200 Engineering Mathematics I

Abbreviation: EMI

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	3 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LUT School of Energy Systems 100%
Responsible persons	Barkat Bhayo, Responsible teacher Annukka Ilves, Administrative person Minna Loikkanen, Administrative person
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: The course is taught in Lappeenranta and Lahti

Prerequisites

EN: Basic knowledge of fundamental mathematics

Equivalences to other studies

LES10A010 Engineering Mathematics 1

Learning outcomes

EN: After completing this course, students will learn calculations and the utilization of formulas and identities to simplify mathematical expressions and solve equations. Moreover, they will grasp the concepts of limits and derivatives, enabling them to evaluate questions related to these topics by applying the rules of limits and derivatives, and understanding their applications in engineering problems. Additionally, students will acquire the ability to evaluate various types of integrals and measure the area and volume of geometrically shaped bodies, and applications in Engineering (electrical, energy & environmental, and mechanical). Furthermore, they will develop a basic understanding of modeling and solving initial value problems.

Content

EN: Function theory: definition of difference types of functions, inverse function, composite function, and their inverse, usage of functions in engineering problems
Trigonometric functions: Definitions, identities of trigonometric functions, modelling waves, current waveforms, sinusoidal voltage signals.

Limit: definition of limit, continuity and discontinuity, limit of composite functions.

Differentiation: slope, Newton Quotient, definition of limit, rules of differentiation, Chain rule, higher order derivative, rate of change, monotonicity, maximum and minimum, extrema, application problems in engineering, L'Hôpital's rule.

Integration: definition and rules of integration, initial values problems, change of variables, Riemann sums and definite integral, applications of integration (mean and average of a function, area under the curve, area bounded by region, arc length, volume of solid), techniques of integration.

Additional information

EN: This course replaces LES10A010 Engineering Mathematics 1 together with LES10A210 Engineering Mathematics II.

Moreover, the course is related to UN's Sustainable Development Goals (SDG): 4 quality education, 5 gender equality, 8 decent work and economic growth, 9 industry, innovation and infrastructure, 10 reduced inequalities, and 17 partnership for the goals.

Study materials

EN: Lecture material and other material are given during the course.

Literature

Robert A. Adams: Calculus - A Complete Course (any edition)

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period	3 cr
Course Enrolment		0 cr
Course Assessment		3 cr

LES10A210 Engineering Mathematics II

LES10A210 Engineering Mathematics II

Abbreviation: LES10A210 EMII

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	3 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LUT School of Energy Systems 100%
Responsible persons	Barkat Bhayo, Responsible teacher Annukka Ilves, Administrative person Minna Loikkanen, Administrative person Markku Kuosa, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: This course is taught in Lahti and Lappeenranta

Prerequisites

EN: Basic knowledge of fundamental mathematics

Equivalences to other studies

LES10A010 Engineering Mathematics 1

Learning outcomes

EN: After completing this course, students will achieve the knowledge of parametrizing curves and solving related problems. Moreover, they will gain conceptual understanding of matrices and their operations, along with applications. Students will be able to interpret engineering problems using vectors and find solutions by applying vector properties and operations. They will also attain knowledge of complex numbers, their mappings, and applications of analytic and harmonic functions in engineering (electrical, energy & environmental, and mechanical).

Content

EN: Curves: Curves and their types, parametric equations, length of curve, area of surface of revolution.
Coordinates: Polar coordinates, cylindrical and spherical coordinates, and their applications

Matrices : Definition and operations on matrices, pixel, applications to transformation, determinant, Cramer's rule, inverse of matrix, solving system of linear equations, Gaussian elimination, eigenvalues, characteristic equation.

Vectors: Definition, dot product, cross product, work, are of parallelogram, volume of parallelepiped, coplanar vectors, vector equation of line, distance from a point to line or plane, applications in engineering.

Complex analysis: Definition, operations of complex numbers, polar form, Euler's formula, complex mappings, functions of complex variables, analytic function, harmonic function, applications in engineering, Möbius transformation, conformal mappings, and their applications in engineering.

Additional information

EN: This course replaces LES10A010 Engineering Mathematics 1 together with LES10A200 Engineering Mathematics I. The course is related to UN's Sustainable Development Goals (SDG): 4 quality education, 5 gender equality, 10 reduced inequalities

Study materials

EN: Lecture notes and course material will be provided during the course.
Optionally Robert A. Adams: Calculus - A Complete Course, and/or Erwin Kreyszig: Advanced Engineering Mathematics.

Literature

Robert A. Adams: Calculus - A Complete Course

Erwin Kreyszig: Advanced Engineering Mathematics

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 2. period	3 cr
Course Enrolment		0 cr
Course Assessment		3 cr

LES10A290 Overview of China

LES10A290 Overview of China

Curriculum period	2024-2025
Validity period	since 1 Aug 2024

Credits	4 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LUT School of Energy Systems 100%
Responsible persons	Changyang Li, Responsible teacher Annukka Ilves, Administrative person ⚠ [information missing], Responsible teacher ⚠ [information missing], Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Prerequisites

EN: Students should have an interest in the traditions and modern life of China.

Learning outcomes

EN: Upon completion of the course, students will be able to:

- Enrich themselves with the tradition and modernization of China;
- Understand the philosophy, policies and behavioral patterns that have shaped China into what it is today;
- Comment on the story of China with sound argumentation and reexamine the ties between China and the world with fresh perspectives;
- Find new opportunities to get involved in the collaboration between their home nations and China.

Content

EN: The course introduces students to a panorama of China through a task-based learning approach. Students will read recommended materials, discover related official websites, attend lectures, write video reviews and accomplish team projects to obtain a better understanding of the given topics like but not limited to below,

- Land of opportunities: leading Chinese cities with their unique characteristics
- You must see it: cultural heritages and tourist attractions in China
- A gourmet paradise: Chinese food and drinks
- Cultural kaleidoscope: local customs and folk arts in China
- Profound changes in Chinese society: life style and technological advancement
- Oriental wisdom: essence of Chinese traditional philosophy

Study materials

EN: 1.Peng Guo, Long Cheng, China Panorama, Beijing, Higher Education Press, 2012
2.Xiaowei Zang, Understanding Chinese Society (Second Edition), New York, Routledge, 2016
3.Aimin Cheng, Understanding China, Shanghai: Shanghai Foreign Languages Education Press, 2018
4.Handouts and online resources from a variety of official websites

Literature

Xiaowei Zang, Understanding Chinese Society (Second Edition), New York, Routledge, 2016

Peng Guo, Long Cheng, China Panorama, Beijing, Higher Education Press, 2012

Aimin Cheng, Understanding China, Shanghai: Shanghai Foreign Languages Education Press, 2018

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	4 cr
Course Completion		4 cr

LES10A410 Engineering Project Work

LES10A410 Engineering Project Work

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	5-10 cr
Languages	English, Finnish
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LUT School of Energy Systems 100%
Responsible persons	Michael Child, Responsible teacher Alex Rosu, Responsible teacher Annukka Ilves, Administrative person
Study level	⚠ [information missing]
Study field	⚠ [information missing]

Recommended prerequisites

BK10A6101 Technical Documentation and 3D Modeling

BK10A6300 Engineering Design

Learning outcomes

EN: After successfully completing the mandatory part of the course , students are able to:

- apply knowledge gained from earlier course work to practice
- improving time management, critical thinking and problem-solving skills
- collaborate effectively and systematically in a multicultural environment
- develop creative ideas and solutions to real-world problems
- planning and implementing a product development project as part of development team based on a written project plan.
- design and implement a product or service
- incorporate end-user or customer needs into product/service design
- give and receive feedback on the effectiveness of project activities
- making a connection between innovation, design, and production with the sustainable development goals (SDGs)

Additionally, depending on amount of optional credits:

- use tools and other resources to develop a prototype.
- testing a prototype to come up with further development suggestions while also reporting the results of the project
- presenting a built prototype to a real audience of peers and invited corporate sponsors during the spring's JHC seminar at Lappeenranta campus or other event
- prepare supplementary plan for further development of the prototype

Content

EN: The course enhances experience in challenge based learning through a learning-by-doing approach. Students will be engaged in solving a specific real-world problem or answering a complex question related to one of the core areas of expertise (Electrical engineering, Energy technology, Mechanical engineering, Environmental Technology etc.). In the end, students will demonstrate new knowledge and skills by developing a useful product or service in cooperation with possible corporate sponsors and presenting it to a real audience.
Students will receive extended instruction on the nature of challenge based learning, and then apply this knowledge to the project work. First steps will involve defining the question, problem or challenge that will

serve as the basis of the project work. This will be followed by the design of a prototype product or service (and based on achievable additional credits, the construction phase of the prototype will also be involved). Throughout the project work, students will give, receive and use feedback to further improve their process and prototypes. Possible corporate sponsors may also provide feedback throughout the project. After refinement, the designed product/service and possible prototype will be explained, displayed, and presented to peers and possible corporate sponsors.

Additional information

EN: Blended learning
***

Students can participate in their group's project work on both campuses (Lappeenranta/Lahti)

***

It is possible to achieve a total of 10 credits in the course:

- mandatory 5 ECTS are gained during periods 1-2
- additional/optional 5 ECTS can be gained during periods 3-4

***

The course is related to the UN's Sustainable Development Goals (SDG), depending on the project chosen:

1) no poverty

2) zero hunger

3) good health and well-being

4) quality education

5) gender equality

6) clean water and sanitation

7) affordable and clean energy

8) decent work and economic growth

9) industry, innovation and infrastructure

10) reduced inequalities

11) sustainable cities and communities

12) responsible consumption and production

13) climate action

14) life below water

15) life and land

16) peace, justice and strong institutions

17) partnership for the goals

Study materials

EN:

- Material available in Moodle
- J. Michael Bennett, Project Management For Engineers, World Scientific Publishing Co Pte Ltd, 2014, ISBN 978981322485
- Pahl G. ; Beitz W., 1996. Engineering Design: A Systematic Approach, London, Springer. 543 s.

- Ulrich K.T. ; Eppinger S.D. 2000. Product Design and Development. New York, Irwin McGraw-Hill. 358 s.
- Virkkala V., 1994. Luova ongelmanratkaisu. Helsinki. 292 s.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-4. period	5-10 cr
Participation in teaching		5-10 cr

LES10A420 Overview of China

LES10A420 Overview of China

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	3 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LUT School of Energy Systems 100%
Responsible persons	Changyang Li, Responsible teacher Annukka Ilves, Administrative person ⚠ [information missing], Responsible teacher ⚠ [information missing], Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Prerequisites

EN: Students should have an interest in the traditions and modern life of China.

Learning outcomes

EN: Upon completion of the course, students will be able to:
·Enrich themselves with the tradition and modernization of China;
·Understand the philosophy, policies and behavioral patterns that have shaped China into what it is today;
·Comment on the story of China with sound argumentation and reexamine the ties between China and the world with fresh perspectives;
·Find new opportunities to get involved in the collaboration between their home nations and China.

Content

EN: The course introduces students to a panorama of China through a task-based learning approach. Students will read recommended materials, discover related official websites, attend lectures, write video reviews and accomplish team projects to obtain a better understanding of the given topics like but not limited to below,
·Land of opportunities: leading Chinese cities with their unique characteristics
·You must see it: cultural heritages and tourist attractions in China
·A gourmet paradise: Chinese food and drinks
·Cultural kaleidoscope: local customs and folk arts in China
·Profound changes in Chinese society: life style and technological advancement
·Oriental wisdom: essence of Chinese traditional philosophy

Study materials

EN: 1.Peng Guo, Long Cheng, China Panorama, Beijing, Higher Education Press, 2012
2.Xiaowei Zang, Understanding Chinese Society (Second Edition), New York, Routledge, 2016
3.Aimin Cheng, Understanding China, Shanghai: Shanghai Foreign Languages Education Press, 2018

4.Handouts and online resources from a variety of official websites

Literature

Peng Guo, Long Cheng, China Panorama, Beijing, Higher Education Press, 2012
Xiaowei Zang, Understanding Chinese Society (Second Edition), New York, Routledge, 2016
Aimin Cheng, Understanding China, Shanghai: Shanghai Foreign Languages Education Press, 2018

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	3 cr
Course completion		3 cr

BK10A6202 Mechatronics

BK10A6202 Mechatronics

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	5 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LES, Mechanical Engineering 100%
Responsible persons	Annukka Ilves, Administrative person Heikki Handroos, Responsible teacher Ming Li, Contact-info
Study level	Intermediate studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Location: Lappeenranta

Equivalences to other studies

BK60A0200 Mechatronics

Equivalences (free text field)

EN: BK10A6200 Mechatronics 5 ECTS cr

Learning outcomes

EN: After successfully completing the course, students are able to:
· summarize the structures, properties, advantages and drawbacks associated with different mechatronic transmissions.
· select an appropriate control, sensor and data transmission system for various kinds of mechatronic machines
· dimension, compare and select appropriate components for a mechatronic system<
· develop a PLC-based control for a mechatronic machine

Content

EN: Typical designs of mechatronic systems in various industrial machines and processes. Structures, operating principles and selection criteria of mechatronic components. Dimensioning hydraulic, pneumatic and

electrical transmissions by using mathematical equations. Selection criteria for sensors and control systems. Accuracy of measurement and sensing systems. Intelligent materials in actuators.

Study materials

EN: Lecture notes in the Moodle

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	5 cr
¤LAB/LUT: Course Assessment		5 cr
¤LAB/LUT: Course Enrolment		0 cr
Method 2	Recurrence 1: 1. period-2. period	5 cr
¤LAB/LUT: Course Enrolment		0 cr
¤LAB/LUT: Mid-term 1		0 cr
¤LAB/LUT: Mid-term 2		5 cr
Method 3	Recurrence 1: 1. period-2. period	5 cr
¤LAB/LUT: Course Assessment		5 cr
¤LAB/LUT: Course Enrolment		0 cr
Method 4	Recurrence 1: 1. period-2. period	5 cr
¤LAB/LUT: Course Enrolment		0 cr
¤LAB/LUT: Mid-term 1		0 cr
¤LAB/LUT: Mid-term 2		5 cr

BK10A7300 Machine Elements and Principles

BK10A7300 Machine Elements and Principles

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	5 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LES, Mechanical Engineering 100%
Responsible persons	Annukka Ilves, Administrative person Charles Nutakor, Responsible teacher
Study level	Intermediate studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Place of Study: Lappeenranta

Compulsory prerequisites

BK10A5800 Engineering Mechanics 1

BK10A6000 Engineering Mechanics 2

BK10A6300 Engineering Design

Equivalences to other studies

BK65A0203 Engineering Design

Learning outcomes

EN: Students who complete the course will demonstrate the following outcomes by project work and written report:
- how to work target-oriented in a machine design team

- how to design or select machine elements for improved performance

In addition, a student understands the basic skills and knowledge required in real-world machine element design. Key learning outcomes are

- Understanding the relations between distance, time, velocity, and acceleration

- Applying vector mechanics to solve kinematic problems

- Creating schematic drawings of real-world mechanisms

- Determining the degrees of freedom (mobility) of a mechanism

- Using graphical and analytic methods to study the motion of planar mechanisms

- Using computer software to study the motion of a mechanism

- Designing cam and gear mechanisms

- Distinguishing the machine elements of machinery

- Understanding the impact of lubrication on machine elements

Content

EN: This course builds upon students' preliminary engineering mechanics and design knowledge. The aim is to help students understand the interactions between machine elements and how they affect the performance of mechanical systems. The course covers advanced concepts of the theory of machines and mechanisms and lubrication. The focus is on practices and procedures that will give students the expertise to apply kinematics analysis in designing mechanisms and understand how to synthesize the linkages in such mechanisms. The lubrication of machine elements is an essential aspect of the course as it governs the performance of mechanical components. The technical considerations primarily relate to the interaction between machine elements. We aim to demonstrate engineering procedures that involve selecting, specifying, designing, and sizing mechanisms to achieve specific motion objectives. Students are free to use computer software such as SolidWorks, MATLAB, Python, KISSsoft, or ROMAX to solve problems related to machine elements.

Additional information

EN: This course is related to all UN's Sustainable Development Goals (SDG): 7 and 11.

Study materials

EN: 1. Uicker Jr., John J and Pennock, Gordon R and Shigley, Joseph E, (2017). Theory of Machines and Mechanisms. (5th ed.) Cambridge University Press
2. Schmid, Steven R, Hamrock, Bernard J and Jacobson, Bo O, (2013). Fundamentals of Machine Elements (3rd ed.). CRC Press

Literature

Uicker Jr., John J and Pennock, Gordon R and Shigley, Joseph E, (2017). Theory of Machines and Mechanisms. (5th ed.) Cambridge University Press

Schmid, Steven R, Hamrock, Bernard J and Jacobson, Bo O, (2013). Fundamentals of Machine Elements (3rd ed.). CRC Press

Norton, RL, (2020). Design of Machinery: An Introduction to the Synthesis and Analysis of Mechanisms and Machines. (6th ed.) McGraw-Hill Education,

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	5 cr
Course Completion		5 cr
Method 2	Recurrence 1: 1. period-2. period	5 cr
Course Completion		5 cr

CT30A3232 Basics of Linux

CT30A3232 Basics of Linux

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	3 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Software Engineering 100%
Responsible persons	Jonna Naukkarinen, Administrative person Jouni Ikonen, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs)

Tweet text

EN: Location: Lappeenranta and Lahti

Prerequisites

EN: Basic computer use skills

Learning outcomes

EN: Upon completion of the course the student has the transferable skills for workstation use in later courses in computer science. Students are able log in to a Linux machine using both graphical and text based UI, know the basics of Ubuntu operating system, understand the benefits of command line use in Linux, navigate in the file system and manipulate files and their access rights. Additionally the student will know how to use command line I/O redirection, form searches and regular expressions, create shell scripts and use networking programs.

Content

EN: Installation of a Linux operating system. Virtualisation software. Graphical desktop environments in Linux. Terminal and basic command line use. Command line based text editors, command line programs and program installation. Command line I/O and file system management. Regular expressions, shell scripting, command line network programs and file transfer.

Additional information

EN: Note
Can't be included in the same degree as CT30A3230 Työaseman käytön perusteet.

Exam examination available only in LUT University campuses.

The course is related to UN's Sustainable Development Goals (SDG): 9 industry, innovation and infrastructure, 10 reduced inequalities, 11 sustainable cities and communities, 12 responsible consumption and production, 17 partnership for the goals

Study materials

EN: Just Enough Linux - Learning about Linux one command at a time / Malcolm Maclean (online)
Linux Fundamentals / Paul Cobbaut (online)

Advanced Bash-Scripting Guide / Mendel Cooper (online)

Getting to know Terminal: Linux and command line management, Lappeenrannan teknillinen yliopisto 2015, Annika Ikonen, Timo Hynninen ja Erno Vanhala

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	3 cr
Course Completion		3 cr
Method 2	Recurrence 1: 1. period-2. period	3 cr
Course Completion		3 cr

CT60A5540 Computer networks and Internet

CT60A5540 Computer networks and Internet

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	3 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Software Engineering 100%
Responsible persons	Jonna Naukkarinen, Administrative person Jouni Ikonen, Responsible teacher
Study level	Intermediate studies
Study field	Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs)

Tweet text

EN: Location: Lappeenranta and Lahti

Prerequisites

EN: computer usage skills

Learning outcomes

EN: At the end of the course students will be able to
1. Understands how data transfer is done in internet and knows what kind of components are involved and what are their tasks.

2. Explain why layered network model is needed.

3. Understands how each layer of tcp/ip model works.

Content

EN: In today's connected world everybody should understand in some level how data is transferred in networks and more so in case of people building services used over Internet. Course familiarizes student with knowledge of how Internet works, what kind of components are involved and what kind of protocols are in-

volved. Topics include network topologies, network reference model, Data link layer (multiplexing, Ethernet, WLAN), network layer(switching, internet protocol), transport layer (tcp, udp), application layer (dns, http).

Additional information

EN: Course has an introduction lecture
The course is related to UN's Sustainable Development Goals (SDG): 8 decent work and economic growth, 9 industry, innovation and infrastructure, 10 reduced inequalities, 11 sustainable cities and communities.

Study materials

EN: Computer Networking: A Top-Down Approach, 8th Edn 2022 James F. Kurose and Keith W. Ross

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period	3 cr
Course Completion		3 cr
Method 2	Recurrence 1: 1. period	3 cr
Course Completion		3 cr

CT70A9110 Software Development Skills: Front-End

CT70A9110 Software Development Skills: Front-End

Abbreviation: CT00CM00

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	3 cr
Languages	English
Grading scale	Pass-Fail
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Software Engineering 100%
Responsible persons	Jonna Naukkarinen, Administrative person Erno Vanhala, Responsible teacher
Study level	Intermediate studies
Study field	Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs)

Tweet text

EN: Location: Lappeenranta (online)

Prerequisites

EN: CT30A2803 User Interfaces and Usability
CT60A0203 Introduction to Programming (or equivalent)

Compulsory prerequisites

CT30A2803 User Interfaces and Usability

CT60A0203 Fundamentals of Programming

Learning outcomes

EN: 1. Develop practical skills for software development
2. Learn the best practices and approaches of software development

3. Develop the skilled expected in industry to work as a software developer.

Content

EN: This course aims give students a chance to create unique projects with a hands-on approach.

The course guides students to find their interest in software engineering skills and to help each student find their desired path in software developing in the future. There are also several other Software Development Skill courses available on different topics.

The goal in this course is to make a responsive webpage using html, CSS and a little JavaScript. These are the basic tools to make today's web-frontend. Students may use Bootstrap or animations in addition. The project focuses only on the layout, styles and the overall structure of the page.

Course is 100% online self-study.

Additional information

EN: ***

The course is related to UN's Sustainable Development Goals (SDG):9 industry, innovation and infrastructure, 10 reduced inequalities

Study materials

EN: Available online (Moodle)

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-Summer	3 cr
¤LAB/LUT: Course Completion		3 cr

CT70A9140 Software Development Skills: Full-Stack

CT70A9140 Software Development Skills: Full-Stack

Abbreviation: CT00CM01

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	3 cr
Languages	English
Grading scale	Pass-Fail
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Software Engineering 100%
Responsible persons	Jonna Naukkarinen, Administrative person Erno Vanhala, Responsible teacher
Study level	Intermediate studies
Study field	Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs)

Tweet text

EN: Location: Lappeenranta (online)

Prerequisites

EN: CT30A2803 User Interfaces and Usability
CT60A0203 Introduction to Programming

CT60A2411 Object-Oriented Programming

CT60A4304 Basics of Database Systems
(or equivalent)

Compulsory prerequisites

CT30A2803 User Interfaces and Usability

CT60A0203 Fundamentals of Programming

CT60A2411 Object-Oriented Programming

CT60A4304 Basics of database systems

Learning outcomes

EN: 1. Develop practical skills for software development
2. Learn the best practices and approaches of software development

3. Develop the skilled expected in industry to work as a software developer.

Content

EN: This course aims give students a chance to create unique projects with a hands-on approach.

The course guides students to find their interest in software engineering skills and to help each student find their desired path in software developing in the future. There are also several other Software Development Skill courses available on different topics.

The course gives the student basic understanding of full-stack development. The goal is to create a basic front- and back-end and bundle them together as a complete system.

The focus is to understand the bigger picture and how to bundle different software components together to create a working program. You will learn how to use MEAN-stack as a full stack tool bundle to create an app from scratch.

Course is 100% online self-study.

Additional information

EN: ***

The course is related to UN's Sustainable Development Goals (SDG):9 industry, innovation and infrastructure, 10 reduced inequalities

Study materials

EN: Available online (Moodle)

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-Summer	3 cr
¤LAB/LUT: Course Completion		3 cr

CT70A9120 Software Development Skills: Mobile

CT70A9120 Software Development Skills: Mobile

Abbreviation: CT00CM02

Curriculum period 2024-2025

Validity period	since 1 Aug 2024
Credits	3 cr
Languages	English
Grading scale	Pass-Fail
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Software Engineering 100%
Responsible persons	Jonna Naukkarinen, Administrative person Erno Vanhala, Responsible teacher
Study level	Intermediate studies
Study field	Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs)

Tweet text

EN: Location: Lappeenranta (online)

Prerequisites

EN: CT30A2803 User Interfaces and Usability
CT60A0203 Introduction to Programming (or equivalent)

Compulsory prerequisites

CT30A2803 User Interfaces and Usability

CT60A0203 Fundamentals of Programming

Learning outcomes

EN: 1. Develop practical skills for software development
2. Learn the best practices and approaches of software development

3. Develop the skilled expected in industry to work as a software developer.

Content

EN: This course aims give students a chance to create unique projects with a hands-on approach.
The course guides students to find their interest in software engineering skills and to help each student find their desired path in software developing in the future. There are also several other Software Development Skill courses available on different topics.

The goal in this course is to make an Android app with Android Studio. The app should have basic functionality with buttons and views. This course aims to teach the basics of mobile development.

Course is 100% online self-study.

Additional information

EN:
***

The course is related to UN's Sustainable Development Goals (SDG):9 industry, innovation and infrastructure, 10 reduced inequalities

Study materials

EN: Available online (Moodle)

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-Summer	3 cr

¤LAB/LUT: Course Completion 3 cr

CT30A2910 Introduction to Web Programming

CT30A2910 Introduction to Web Programming

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	3 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Software Engineering 100%
Responsible persons	Jonna Naukkarinen, Administrative person Erno Vanhala, Responsible teacher
Study level	Intermediate studies
Study field	Fields of education (Ministry of Education and Culture), Information and Communication Technologies (ICTs)

Tweet text

EN: Course can be studied in Lappeenranta, Lahti and fully online

Compulsory prerequisites

CT60A0203 Fundamentals of Programming

Recommended prerequisites

CT60A2411 Object-Oriented Programming

CT30A3232 Basics of Linux

Learning outcomes

EN: At the end of the course student is able to: 1) Understand the programming concepts of the web, 2) Knows how to use HTML and CSS to build responsive web pages, 3) Create simple applications with JavaScript to run inside browsers and 4) Familiarize oneself with responsive design and utilization of external APIs

Content

EN: Web standards: HTTP, HTML, CSS and JavaScript. The browser environment with its Document object model (DOM). Building web sites with commonly used tools.

Additional information

EN: ***

The course is related to UN's Sustainable Development Goals (SDG):9 industry, innovation and infrastructure, 10 reduced inequalities

Study materials

EN: Lecture slides and videos.
Other material announced in the lectures.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period	3 cr

Course Completion 3 cr

VA10A1500 Introduction to Entrepreneurship

VA10A1500 Johdatus yrittäjyyteen

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	5 cr
Languages	English, Finnish
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LBS, Business Administration 100%
Coordinating organisation	University of Oulu 100%
Responsible persons	Hannes Velt, Responsible teacher Roman Teplov, Responsible teacher Suvi Tiainen, Administrative person ⚠ [information missing], Responsible teacher ⚠ [information missing], Responsible teacher
Study level	Intermediate studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law

Tweet text

EN: LITO course

Prerequisites

EN: The course includes a compulsory preliminary assignment that has to be completed successfully by a pre-defined date.

Learning outcomes

EN: During the course, the student will learn to understand the significance of an entrepreneurial team, and will form an understanding of entrepreneurship as a creative activity that happens in the form of business.
After completing the course, the student will be able to:
- define business-related principles, possibilities and challenges
- plan business initiating from customer needs, value creation, testing and agility
- interpret business-related substance areas where competence is needed

Content

EN: The decision to become an entrepreneur:
- an introduction to entrepreneurship
Creating viable business ideas:
- creating business opportunities
- preliminary research
- industry analysis
- business plan
From an idea to an entrepreneurial firm:
- building a team
- analysing start-up strengths and weaknesses from the funding perspective
- ethical and legal issues when starting a company
- writing a business plan and constructing a story
- attracting funding
Managing an entrepreneurial firm and creating growth:
- marketing

- Understanding VC (Venture Capital) operation
- IPRs (Intellectual Property Rights)
- The challenges of growth and managing growth
- growth strategies
- operation forms

Additional information

EN: Note
Only for students of technology.

Please note that the students of LUT Master's programme in Entrepreneurship can NOT include this course in their Minor nor degree.

The latest information about the course is updated and published on the course platform at www.lito.fi.

The course will run from early October to December 2024 (Weeks 40–48). There is a pre-assignment in week 40.

Please note that the completion of the course takes place on the DigiCampus learning platform. Login instructions to the platform will be provided to the students who have registered for the course via email.

The LITO courses are organised in co-operation with multiple universities. To enable registering credits when the course is completed, it is necessary to transfer data about the student from their home university to the university that is responsible for organizing the course. The data to be transferred consists of: name, gender, nationality, e-mail address, personal identification number and the home university. Data that is classified as secret is not transferred. Without data transfer it is not possible to have the course credits registered.

Study materials

EN: Barringer, B. ; Ireland. D. (2012). Entrepreneurship: Successfully Launching New Ventures, 4th Edition. Prentice Hall. Later editions can also be used, but please note that the page numbers for the later versions vary.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	5 cr
Course Completion		5 cr

VA10A1700 Understanding and Managing a Business as a Dynamic Whole - Business Simulation Game

VA10A1700 Liiketoimintaosaamisen kokonaisdynamiikka ja sen ohjaaminen - yrityssimulaatio

Curriculum period	2024-2025
Validity period	since 1 Aug 2024
Credits	5 cr
Languages	English, Finnish
Grading scale	Pass-Fail
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	Education other than LUT University 100%
Coordinating organisation	University of Turku 100%

Responsible persons	Suvi Tiainen, Administrative person ⚠ [information missing], Responsible teacher
Study level	Intermediate studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law

Tweet text

EN: LITO course

Prerequisites

EN: The course serves as a capstone, bridging together the other modules in the LITO entity. The course provides an overall picture of business dynamics and explains how the different fields of business studies are related to it. Various tools and services outside the LITO learning platform may be used in the analyses during the course.
It is recommended that before taking this course, the student has taken at least the following LITO courses: 'Introduction to Accounting and Financial Management' and 'Basics of Management and Organisations'. Alternatively, the student must possess sufficient previous knowledge in these fields in order to be able to analyse a business as a whole.

Recommended prerequisites

VA10A1000 Basics of Management and Organisations

VA10A1200 Introduction to Accounting and Financial Management

Learning outcomes

EN: After completing the course, students will be able to:
· describe how different areas in business studies are connected in the entity of enterprise functions and in making a profit

· apply various methods of collaboration in a virtual team and to become aware of the key regularities in the collaborative business environment

· apply different business analysis tools in planning and managing a business and understand the essential role of strategy in the process.

A central part of the course is the optimisation of a business as a whole with respect to both various business functions and goals; students will understand why it is not practical to optimise single functions separately and why the management needs to have a holistic perspective of the company that simultaneously takes into account social, ecological and financial responsibility.

Content

EN: · The foundation for this course is a decentralised and collaborative business simulation exercise in which students work in teams and collaborate with other teams. Besides engaging in real-time decision-making during the simulation days, the students will complete assignments that relate to various business sciences and analyse the actions taken in the simulation outside the simulation days.
· Participation takes place in small virtual groups, the members of which come from different universities.

· The thematic core for the simulation is the entity formed by the different functions of a company and the responsible agency of the company in a network of enterprises. The relevant themes include several areas of cross-company functions (purchasing, project management, distribution and customer relationships) and the reporting related to these topics. The course emphasises the entity of business operations from the perspective of responsible management.

· During the course, students are introduced to the dynamics of business networks where the students' company is part of a network of competitors, suppliers and customers.

· The theoretical material and the exercises distributed on the course are related to the thematic core for the simulation and for other LITO learning themes.

Additional information

EN: The first course period runs from late September to late November 2024 (Weeks 39–47). There is a pre-assignment in Week 39.
The second course period runs from late January to late March 2025 (Weeks 4–12). There is a pre-assignment in Week 4.

The third course period runs from mid-March to mid-May 2025 (Weeks 11–19). There is a pre-assignment in Week 11.

Please note that the completion of the course takes place on the DigiCampus learning platform. Login instructions to the platform will be provided via email.

The LITO courses are organised in co-operation with multiple universities. To enable registering credits when the course is completed, it is necessary to transfer data about the student from their home university to the university that is responsible for organizing the course. The data to be transferred consists of: name, gender, nationality, e-mail address, personal identification number and the home university. Data that is classified as secret is not transferred. Without data transfer it is not possible to have the course credits registered.

Study materials

EN: The literature includes: simulation game instructions, a description of the simulation environment, learning videos, a course hand-out and a selection of other articles (to be announced).

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period Recurrence 2: 4. period, 3. period Recurrence 3: 4. period	5 cr
Course Completion		5 cr