Filters used for the printout

Curriculum period: 2025-2026. **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 2025-2026

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
Credits	min 20 cr
Languages	English
Grading scale	Grading scale for degrees (distinction)
Content approval required	no
Locations	⚠ [information missing]
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	Lappeenranta-Lahti University of Technology LUT 100%
Responsible persons	Tarja Pettinen, Responsible teacher Armi Rissanen, Responsible teacher Jonna Naukkarinen, Responsible teacher Minna Loikkanen, 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
DEXCHAUTUMNLPR LAPPEENRANTA, EXCHANGE STUDIES (AUTUMN SEMESTER) DRAFT	min 0 cr
MASTER'S LEVEL STUDIES, LAPPEENRANTA (grouping module)	
KEDEXCHAUTUMN_LPR CHEMICAL ENGINEERING DRAFT	min 0 cr
BJ02A0061 Laboratory Safety Course DRAFT	2 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
BJ02A3010 Membrane Technology DRAFT	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
BJ03A1020 Biological Waste Water Treatment DRAFT	5 cr
BJ03A1040 Advanced Materials in Adsorption and Ion Exchange DRAFT	5 cr
BJ02A0011 Laboratory Work Course in Chemical Technology DRAFT	10 cr
BJ02A0012 Advanced Laboratory Course in Chemical Technology DRAFT	30 cr
BJ02A6020 Power-to-X processes DRAFT	5 cr
BJ02A0070 Introduction to Process Simulation DRAFT	3 cr
LADEXCHAUTUMN_LPR COMPUTATIONAL ENGINEERING DRAFT	min 0 cr
BM40A1800 Photonics DRAFT	6 cr
BM40A0702 Pattern Recognition and Machine Learning DRAFT	6 cr

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_LPR 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

BL30A0801 Electromagnetic Components 3 cr
DRAFT

BL30A1030 Electrical Machines 4 cr
DRAFT

BL30A1040 Electrical Drives 1 4 cr
DRAFT

BL30A1050 Electrical Drives 2 4 cr
DRAFT

BL30A1300 Power Electronic Converters 5 cr
DRAFT

BL40A0510 Digital Control 1 4 cr
DRAFT

BL40A1101 Embedded System Programming 5 cr
DRAFT

BL40A2055 Wireless Communications 8 cr
DRAFT

BL40A2810 Automation 6 cr
DRAFT

BL50A1402 Analog Electronics 2 6 cr
DRAFT

ENDEXCHAUTUMN_LPR 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_LPR 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

BH60A5401 Introduction to Circular Economy 5 cr
DRAFT

TUDEXCHAUTUMN_LPR 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

CS30A1372 Creative Design and Problem Solving 6 cr
DRAFT

CS39A0221 Technology design for disability and inclusion 3 cr
DRAFT

CS30A0810 Must-Have Math for Decision Makers 3 cr
DRAFT

CS30A0820 The Dark Side of Sustainability 3 cr
DRAFT

CS40A0170 Interdisciplinary Course on Sustainable Finance 5-6 cr
DRAFT

KODEXCHAUTUMN_LPR MECHANICAL ENGINEERING min 0 cr
DRAFT

- BK10A3801 Principles of Industrial Manufacturing Processes 7 cr
  DRAFT
- BK10A3900 Reliability Based Machine Element Design 5 cr
  DRAFT
- BK70A0001 Simulation of a Mechatronic Machine 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
- BK80A1403 Fatigue 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

FYDEXCHAUTUMN_LPR PHYSICS min 0 cr
DRAFT

- FY30A1000 Introduction to Particle Physics 5 cr
  DRAFT

TIDEXCHAUTUMN_LPR 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
- CT80A0300 Software and Application Innovation 6 cr
  DRAFT
- CT60A5401 Game Development Project 6 cr
  DRAFT
- CT80A0000 Data-Intensive Systems 6 cr
  DRAFT

LESDEXCHAUTUMN_LPR LUT SCHOOL OF ENERGY SYSTEMS min 0 cr
DRAFT

- LES10A170 Applied Mathematics I 4 cr
  DRAFT

BACHELOR'S LEVEL STUDIES, LAPPEENRANTA (grouping module)

KAKEXCHAUTUMN_LPR 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
- 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
- KAKEXCHLITOAUTUMN_LPR BUSINESS ADMINISTRATION ONLY FOR ENGINEERING AND SOCIAL SCIENCE 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

LAKEXCHAUTUMN_LPR COMPUTATIONAL ENGINEERING min 0 cr
DRAFT

SAKEXCHAUTUMN_LPR 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
- BL40A0130 Measurement and Control Systems 5 cr
  DRAFT
- BL40A1732 Digital Electronics 3 cr
  DRAFT
- BL40A5000 Principles of C-Programming 3 cr
  DRAFT

ENKEXCHAUTUMN_LPR ENERGY TECHNOLOGY min 0 cr
DRAFT

- BH20A0720 Engineering Thermodynamics 6 cr
  DRAFT
- BH10A1900 Fundamentals of Energy Technology 2 cr
  DRAFT

- **BH61A0000** Fundamentals of Energy Economics 2 cr
  DRAFT
- **BH40A0710** Measurements in Energy Technology 2 cr
  DRAFT

YMKEXCHAUTUMN_LPR ENVIRONMENTAL TECHNOLOGY min 0 cr
DRAFT

- **BH60A7200** Circular.now 3 cr
  DRAFT
- **BH60A6801** Sustainable.now 3-5 cr
  DRAFT

LESKEXCHAUTUMN_LPR 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
- **LES10A410** Engineering Project Work 5-10 cr
  DRAFT

KOKEXCHAUTUMN_LPR MECHANICAL ENGINEERING min 0 cr
DRAFT

- **BK10A6202** Mechatronics 5 cr
  DRAFT
- **BK10A7300** Machine Elements and Principles 5 cr
  DRAFT
- **BK10A6400** Basics of FE-Analysis 4 cr
  DRAFT

TIKEXCHAUTUMN_LPR SOFTWARE ENGINEERING min 0 cr
DRAFT

- **CT30A3232** Basics of Linux 3 cr
  DRAFT
- **CT60A5540** Computer networks and Internet 3 cr
  DRAFT
- **CT70A9111** Software Development Skills: Front-End 1 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
- **CT70A9150** Introduction to DevOps 3 cr
  DRAFT

YTKEXCHAUTUMN_LPR SOCIAL SCIENCES min 0 cr
DRAFT

- **VT10A1400** Environmental Communication 5 cr
  DRAFT
- **VT10A1500** Political Communication, Social Movements and Activism 5 cr
  DRAFT

LANGUAGE STUDIES, LAPPEENRANTA (grouping module)

KIEEXCHAUTUMN_LPR 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
- **K200CG35** Finnish for Work 2 — 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
- **K200DE18** Suomi with Love 2 — 3 cr
  DRAFT
- **K200CS72** Independent study in Finnish — 2 cr
  DRAFT

ENGLISH (grouping module)

- **KE00BZ84** English for Professional Development (Business) — 4 cr
  DRAFT
- **KE00BZ85** English for Professional Development (Technology) — 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
- **KE00DG83** English and AI: Terminology, Ethics and Writing — 1 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

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)

INTERCULTURAL COMPETENCE AND COMMUNICATION (grouping module)

- KM00BX75 Each one teach one — 3 cr — DRAFT
- KE00CF69 Intercultural Competence and Communication — 5 cr — DRAFT
- KE00CH94 Diversity Management and Global Citizenship — 5 cr — DRAFT
- KM00CO04 Finnish Culture and Society — 3 cr — DRAFT

DEXCHAUTUMNLAHTI LAHTI, EXCHANGE STUDIES (AUTUMN SEMESTER) — min 0 cr — DRAFT

MASTER'S LEVEL STUDIES, LAHTI (grouping module)

KEDEXCHAUTUMN_LAHTI CHEMICAL ENGINEERING — min 0 cr — DRAFT

LADEXCHAUTUMN_LAHTI COMPUTATIONAL ENGINEERING — min 0 cr — DRAFT

- BM20A9001 Numerical Simulation — 5 cr — DRAFT

SADEXCHAUTUMN_LAHTI ELECTRICAL ENGINEERING min 0 cr
DRAFT

ENDEXCHAUTUMN_LAHTI ENERGY TECHNOLOGY min 0 cr
DRAFT

BH10A1900 Fundamentals of Energy Technology 2 cr
DRAFT

YMDEXCHAUTUMN_LAHTI ENVIRONMENTAL TECHNOLOGY min 0 cr
DRAFT

BH60A0252 Solid Waste Management Technology 7 cr
DRAFT

BH60A4402 Sustainability in Socio-Technological context 6 cr
DRAFT

BH60L3000 Biological Cycle in Circular Economy 6 cr
DRAFT

BH60L4000 Technical Cycle in Circular Economy 6 cr
DRAFT

BH60A5401 Introduction to Circular Economy 5 cr
DRAFT

TUDEXCHAUTUMN_LAHTI INDUSTRIAL ENGINEERING AND MANAGEMENT min 0 cr
DRAFT

KODEXCHAUTUMN_LAHTI MECHANICAL ENGINEERING min 0 cr
DRAFT

BK10A1201 Research Methods and Methodologies 5 cr
DRAFT

FYDEXCHAUTUMN_LAHTI PHYSICS min 0 cr
DRAFT

FY30A1000 Introduction to Particle Physics 5 cr
DRAFT

TIDEXCHAUTUMN_LAHTI 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

CT80A0300 Software and Application Innovation 6 cr
DRAFT

CT60A5401 Game Development Project 6 cr
DRAFT

CT80A0000 Data-Intensive Systems 6 cr
DRAFT

- **LESDEXCHAUTUMN_LAHTI** LUT SCHOOL OF ENERGY SYSTEMS — min 0 cr
  DRAFT
  - **LES10A170** Applied Mathematics I — 4 cr
    DRAFT

BACHELOR'S LEVEL STUDIES, LAHTI (grouping module)

- **KAKEXCHAUTUMN_LAHTI** BUSINESS ADMINISTRATION — min 0 cr
  DRAFT
  - **A130A0620** Basics in MS Excel for Business Students — 3 cr
    DRAFT
  - **A380A0131** Business Relationships in International Value Networks — 6 cr
    DRAFT
  - **KAKEXCHLITOAUTUMN_LAHTI** BUSINESS ADMINISTRATION ONLY FOR ENGINEERING AND SOCIAL SCIENCE 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
- **LAKEXCHAUTUMN_LAHTI** COMPUTATIONAL ENGINEERING — min 0 cr
  DRAFT
- **SAKEXCHAUTUMN_LAHTI** ELECTRICAL ENGINEERING — min 0 cr
  DRAFT
- **ENKEXCHAUTUMN_LAHTI** ENERGY TECHNOLOGY — min 0 cr
  DRAFT
  - **BH20A0720** Engineering Thermodynamics — 6 cr
    DRAFT
  - **BH10A1900** Fundamentals of Energy Technology — 2 cr
    DRAFT
  - **BH61A0000** Fundamentals of Energy Economics — 2 cr
    DRAFT
  - **BH40A0710** Measurements in Energy Technology — 2 cr
    DRAFT
- **YMKEXCHAUTUMN_LAHTI** ENVIRONMENTAL TECHNOLOGY — min 0 cr
  DRAFT
  - **BH60A7200** Circular.now — 3 cr
    DRAFT
  - **BH60A6801** Sustainable.now — 3-5 cr
    DRAFT
- **LESKEXCHAUTUMN_LAHTI** 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
    THERE IS NO VERSION OF THE STUDY IN THE SELECTED CURRICULUM PERIOD
  - **LES10A410** Engineering Project Work — 5-10 cr
    DRAFT
  - **LES10A420** Overview of China * — 3 cr
    THERE IS NO VERSION OF THE STUDY IN THE SELECTED CURRICULUM PERIOD

- **KOKEXCHAUTUMN_LAHTI** MECHANICAL ENGINEERING — min 0 cr
  DRAFT
- **TIKEXCHAUTUMN_LAHTI** SOFTWARE ENGINEERING — min 0 cr
  DRAFT
  - **CT30A3232** Basics of Linux — 3 cr
    DRAFT
  - **CT60A5540** Computer networks and Internet — 3 cr
    DRAFT
  - **CT70A9111** Software Development Skills: Front-End — 1 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
  - **CT70A9150** Introduction to DevOps — 3 cr
    DRAFT

LANGUAGE STUDIES, LAHTI (grouping module)

- **KIEEXCHAUTUMN_LAHTI** 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
  - ENGLISH (grouping module)
    - **KE00BZ84** English for Professional Development (Business) — 4 cr
      DRAFT
    - **KE00BZ85** English for Professional Development (Technology) — 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
    - **KE00BX35** English Pronunciation — 1 cr
      DRAFT
    - **KE00CC64** English Prep Course — 3 cr
      DRAFT

- **KE00DG83** English and AI: Terminology, Ethics and Writing — 1 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
- 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)
- INTERCULTURAL COMPETENCE AND COMMUNICATION (grouping module)
  - **KM00BX75** Each one teach one — 3 cr
    DRAFT
  - **KE00CF69** Intercultural Competence and Communication — 5 cr
    DRAFT
  - **KE00CH94** Diversity Management and Global Citizenship — 5 cr
    DRAFT
  - **KM00DA70** Multicultural Teamwork and Leadership — 5 cr
    DRAFT
  - **KM00CO04** Finnish Culture and Society — 3 cr
    DRAFT

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

FILTERED COURSES

BJ02A0061 Laboratory Safety Course

BJ02A0061 Laboratory Safety Course

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
Credits	2 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

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.
Knows basics of good laboratory practices in laboratory working.

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.
During laboratory days there is practical exam and training of basic laboratory practices.

Additional information

EN: 100% attendance required.

Study materials

EN: Materials given in Moodle. e.g slides, videos, material safety data sheets.

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

BJ04A5010 Advanced Biorefineries

BJ04A5010 Advanced Biorefineries

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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

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.
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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	5 cr
Course Completion		5 cr

BJ04A7010 Bioeconomy

BJ04A7010 Bioeconomy

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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

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	2025-2026
Validity period	since 1 Aug 2025
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 Samuel Emebu, Responsible teacher Esko Lahdenperä, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Prerequisites

EN: Either the Finnish course Johdatus tekniseen laskentaan or Principles of Technical Computing, or corresponding skills in MATLAB programming, as well as a knowledge in reaction chemistry and kinetics (i.e., stoichiometric balance, elementary reaction kinetics)

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 (MATLAB).

Content

EN: Basics of chemical reaction system

1. Description and derivation to model chemical reactions system into ordinary differential equations (ODEs) based on the stoichiometric balance of reacting components
2. Solve the derived ODEs in computational software such as MATLAB using odesolver e.g. ode45 and ode15s

Model development and validation

1. Compare the assumed developed model to experimental data.
2. Apply curve-fitting or optimization tools to validate assumed models, using tools such as “Fminsearch”, and “lsqr” via defined objective functions (e.g., standard square error of model and experimental data) to validate the developed model.

Application of model development

1. Model material and energy balances in chemical engineering processes based on steady- and dynamic-state
2. Develop model for batch, semi-batch, and continuous (e.g., CSTR and plug flow reactor) based systems based on ODEs and Partial differential equations (PDEs)
3. Solve and curve-fit the derived ODEs in MATLAB using odesolver as well as optimization tools
4. Apply appropriate boundary conditions and solve the derived PDEs in MATLAB using odesolver via methods of lines, i.e. converting the PDEs into ODEs.

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

Literature

Chemical Reaction Engineering by Octave Levenspiel

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

BJ02A2041 Advanced Process Design

BJ02A2041 Advanced Process Design

Abbreviation: APD

Curriculum period	2025-2026
Validity period	1 Sep 2025-12 Dec 2025
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
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Prerequisites

EN: BJ01A5030 Prosessisimuloinnin perusteet (Basics of Process Simulation). For those students who have not completed this course, they must take BJ02A0070 (Introduction to Process Simulation) in the first period along with Advanced Process Design.

Knowledge of chemical engineering fundamentals (transport phenomena, reaction kinetics, uint operations, and thermodynamics), and Aspen Plus software experiences are needed for this course.

Learning outcomes

EN: Upon completion of the module, the student is able to understand:
– Process design steps
- Process synthesis heuristics for screening design pathways

- Basics of equipment design (reactor, distillation column, heat exchanger, flash column)

- Retrofitting in design

- Energy and environmental aspects of process design

- Process design economy

- Application of Aspen Plus as a process simulation software in 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.

Additional information

EN: 40% workload in Period 1 and 60% workload in Period 2.

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-2. period	5 cr
Course Completion		5 cr

BJ02A3010 Membrane Technology

BJ02A3010 Membrane Technology

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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

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	2025-2026
Validity period	since 1 Aug 2025
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 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.

Prerequisites

EN: NOTE: This course contains laboratory experiments. To do them, laboratory safety course (BJ02A0061 or BJ02A0060)) has to be passed before entering to laboratories.

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	2025-2026
Validity period	since 1 Aug 2025
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

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
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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	2025-2026
Validity period	since 1 Aug 2025
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

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 Yksikköperaatioiden mitoitus B.
The course is mainly aimed for the students of Biorefineries.

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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

BJ03A1020 Biological Waste Water Treatment

BJ03A1020 Biological Waste Water Treatment

Curriculum period	2025-2026
Validity period	1 Jul 2025-30 Sep 2026
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 Marika Kokko, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Prerequisites

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

Equivalences to other studies

BJ04A6010 Biological Waste Water Treatment in Biorefining

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.
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	2025-2026
Validity period	since 1 Aug 2025
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

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

BJ02A0011 Laboratory Work Course in Chemical Technology

BJ02A0011 Laboratory Work Course in Chemical Technology

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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

Prerequisites

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

Compulsory prerequisites

BJ02A0060 Laboratory Safety Course

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	2025-2026
Validity period	since 1 Aug 2025
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

Compulsory prerequisites

BJ02A0060 Laboratory Safety Course

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

BJ02A6020 Power-to-X processes

BJ02A6020 Power-to-X processes

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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 Emma Laasonen, Responsible teacher
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

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: Material given by the teacher

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-4. period	5 cr
Course Completion		5 cr

BJ02A0070 Introduction to Process Simulation

BJ02A0070 Introduction to Process Simulation

Abbreviation: IPS

Curriculum period	2025-2026
Validity period	1 Sep 2025-17 Oct 2025
Credits	3 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
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Learning outcomes

EN: This course is aimed to give an introductory-level knowledge of Aspen Plus and MATLAB as two important software for process and mathematical modeling that will be needed later in more advanced courses. After completing the course, students are able to gain competences on Aspen Plus and MATLAB.
1) Aspen Plus competences:

- Installing and running Aspen on LUT machines or through VPN

- Aspen Plus property and simulation environments
- Running, saving, and opening Aspen files
- Introducing components and models
- Flowsheeting
- Plotting results and finding input-out data

2) MATLAB competences:

- Installing and running MATLAB on LUT machines or through VPN
- Understanding MATLAB environment
- Knowing about scalars, variables, vectors, matrixes, and arrays in MATLAB
- Learning about calculations in MATLAB
- Understanding functions and their structure
- Learning tips on coding with MATLAB

Content

EN: Aspen Plus
- Introduction to Aspen Plus
- Aspen Plus at LUT University
- Aspen Plus Property Environment and Simulation Environment
- Components, streams, equipment, and process flow sheet in Aspen

MATLAB

- Introduction to MATLAB
- MATLAB at LUT University
- MATLAB Academy for learning
- Basics of MATLAB
- Functions and scripts in MATLAB

Study materials

EN: Learning materials on Moodle, MATLAB academy online courses, Aspen Plus software, MATLAB software

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period	3 cr
Online self study		3 cr

BM40A1800 Photonics

BM40A1800 Photonics

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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

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 Registration		0 cr

Course Assessment 6 cr

BM40A0702 Pattern Recognition and Machine Learning

BM40A0702 Pattern Recognition and Machine Learning

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Prerequisites

EN: Ability to program in Matlab or Python.

Recommended prerequisites

BM20A8601 Statistics I

BM20A8701 Matrix Calculus

BM40A1601 Foundations of Artificial Intelligence and Machine Learning

Learning outcomes

EN: The student is able to 1) understand pattern recognition problems and the common approaches to solve them using artificial intelligence in the form of 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 semi-supervised machine learning. Feature extraction and selection, system evaluation. Linear and non-linear classifiers based on linear models, kernels, artificial neural networks and support vector machines. Statistical pattern recognition, parameter estimation and Bayesian inference. Context-dependent and reinforcement learning. Practical pattern recognition and method-independent learning.
Company cooperation: no direct cooperation.
Use of AI applications: readily available AI tools can be used for checking the language of written reports.

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

Murphy, K.P., 2022. Probabilistic Machine Learning: An introduction. MIT Press.

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

BM40A1201 Digital Imaging and Image Preprocessing

BM40A1201 Digital Imaging and Image Preprocessing

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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 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

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 infrastucture.

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 Registration		0 cr
Course Assessment		6 cr

BM20A7401 Inverse Problems

BM20A7401 Inverse Problems

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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
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 Registration		0 cr
Course Assessment		5 cr

BM20A7601 Numerical Methods for Partial Differential Equations

BM20A7601 Numerical Methods for Partial Differential Equations

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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 Toni Karvonen, Responsible teacher
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Prerequisites

EN: Bachelor level studies in mathematics. BM20A7300 Functional analysis or an equivalent course is recommended.

Learning outcomes

EN: How partial differential equations (PDEs) are used in science and technology and how solutions to elliptic and parabolic PDEs can be approximated with the finite element method. Basics of Sobolev spaces, weak solutions to PDEs, and error analysis of the finite element method. After the course students are able to implement a 2D finite element solver and are familiar with finite element software.

Content

EN: The diffusion–advection–reaction equation is a partial differential equation (PDE) that describes a wide variety of phenomena in science and technology, such as transport phenomena in fluid flows. The course covers the basic theory of such elliptic and parabolic PDEs and their numerical solution using the finite element method (FEM). Theoretical topics include basics weak derivatives, Sobolev spaces, weak solutions to PDEs, existence and uniqueness of weak solutions, and error analysis of FEM. The methodological part of the course focuses on piecewise linear FEM and its implementation in 2D for Poisson's equation with Dirichlet boundary conditions. The course also contains an introduction to finite element software (e.g., Elmer).

Additional information

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

3 good health and well-being
4 quality education
5 gender equality
6 clean water and sanitation
9 industry, innovation and infrastructure
10 reduced inequalities
13 climate action
14 life below water
15 life and land

Study materials

EN: Lecture notes and the books
- Knabner & Angerman. Numerical Methods for Elliptic and Parabolic Partial Differential Equations: With contributions by Andreas Rupp. 2nd ed. Springer, 2021. doi:10.1007/978-3-030-79385-2

- Kuzmin & Hämäläinen. Finite Element Methods for Computational Fluid Dynamics: A Practical Guide. SIAM, 2024. https://doi.org/10.1137/1.9781611973617

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

BM20A8501 Probabilistic Simulation

BM20A8501 Probabilistic Simulation

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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

BM20A9001 Numerical Simulation

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 mod-

els 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.

Additional information

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

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 Registration		0 cr
Course Assessment		5 cr

BM20A6100 Advanced Data Analysis and Machine Learning

BM20A6100 Advanced Data Analysis and Machine Learning

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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 Zina-Sabrina Duma, Responsible teacher
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Prerequisites

EN: Ability to program in Matlab or Python.

Recommended prerequisites

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 implement artificial intelligence in the form of machine learning and 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.
Company cooperation: no direct cooperation.
Use of AI applications: readily available AI tools can be used for checking the language of written reports.

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

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 Registration		0 cr
Course Assessment		6 cr
Method 2	Recurrence 1: 1. period-2. period	6 cr
Course Registration		0 cr
Midterm Exam 1		0 cr
Midterm Exam 2		6 cr

BM20A7200 Bayesian Continuous-Parameter Estimation

BM20A7200 Bayesian Continuous-Parameter Estimation

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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
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	2025-2026
Validity period	since 1 Aug 2025
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 Miracle Amadi, Responsible teacher
Study level	Advanced studies

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

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 emphasis 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 instance, image reconstruction, solving linear equations, data compression, 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 backslash)

– Parameter estimation for nonlinear models using Matlab fminsearch 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 coefficient matrix, t-values, Rsquare value, crossvalidation.

– Statistics for nonlinear models: Covariance of estimates by computing 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.

The course is related to UN's Sustainable Development Goal (SDG): 4 Quality Education.The course is related to industry and employment: Research and Development.

Additional information

EN: In addition to lectures and weekly exercises, students attend a mandatory onsite workshop where they independently apply the concepts learned to related questions.
Relevance to employment/industry

The skills gained are essential for careers such as in data science, engineering, and AI. Applications include optimization of industrial processes, climate modeling, and data-driven decision-making.

***

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

13 climate action , 9 industry, innovation and infrastructure.

Study materials

EN: Lecture material available in Moodle

Literature

https://www.researchgate.net/publication/332751929_Chapter_1_Singular_Value_Decomposition#fullTextFileContent

https://www.researchgate.net/profile/Heikki-Haario/publication/229016569_Statistical_Analysis_in_Modelling_MCMC_Methods/links/02e7e528e132575a55000000/Statistical-Analysis-in-Modelling-MCMC-Methods.pdf

https://bilginbari.wordpress.com/wp-content/uploads/2014/08/linearalgebra-and-intro-to-matlab.pdf

http://lya.fciencias.unam.mx/jele/EDOs2k15.2/Libros/A%20First%20Course%20in%20Differential%20Equations%20with%20Modeling%20Applications%2010e%202012%20Zill.pdf

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	2025-2026
Validity period	since 1 Aug 2025
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
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 Registration		0 cr

BL20A1300 Energy Resources

BL20A1300 Energy Resources

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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

Prerequisites

EN: Basic background knowledge in energy related concepts 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 will cover the following topics.
1. Provide an overview of the availability of energy resources and related emissions and the techno-economic maturity of related energy conversion technologies, which induces a fundamental structure for the future energy system and the related energy transition pathway.

2. 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.

3. Provide an overview of different theoretical, technical and economic potentials as well as geographic variations in availability of these energy resources. 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: The learning material is based on the latest research and is distributed to students in Moodle
1. Lecture slides are shared with additional reading links provided at the end of the slides.

2. Exercise class calculations and solutions will be shared in Moodle.

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

BL20A0601 Electrical Power Transmission

BL20A0601 Electrical Power Transmission

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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 Behnam Mohammadiivatloo, Responsible teacher Mohammad Seyfi, Responsible teacher
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

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

Use of AI applications

AI applications can be used for understanding concepts and searching for information, taking into account the constraints of the AI in source criticism. Students have to provide the answers in weekly assignments and exam by own produced text. Students are not allowed to present AI-generated text as their own.

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, 1. period	5 cr
Course Completion		5 cr

BL30A1440 Electric and Hybrid Vehicle Powertrains

BL30A1440 Electric and Hybrid Vehicle Powertrains

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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, electric drives and electric machines 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.

Company cooperation:
Visiting lecturers from companies when possible.

Use of AI applications:
Use of AI (Artificial Intelligence) is not allowed on the course. Seminar presentations, written reports and exam answers should be written
in own words by the student and not by someone else or a third party like AI.

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: The study materials are based on research and distributed to students in Moodle. Including lecture and exercise materials and seminar materials.

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

BL30A0801 Electromagnetic Components

BL30A0801 Electromagnetic Components

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
Credits	3 cr
Languages	English, Finnish
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LES, Electrical Engineering 100%
Responsible persons	Janne Nerg, Responsible teacher Minna Loikkanen, 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: BL30A0300 Electromagnetism attended.

Learning outcomes

EN: Upon completion of the course the student will be able to: 1. design simple transformers and inductors, 2. name and describe magnetic core materials, 3. describe the different loss mechanisms, 4. explain the non-linearities of inductors and transformers at different frequencies, 5. minimise the transformer leakage inductance.

Content

EN: Faraday's induction law, Ampère's law, operation principle of a transformer and an inductor, non-linearities of electromagnetic components, magnetic materials, iron losses and copper losses.

Additional information

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

Study materials

EN: Lecture materials are available in Moodle. The course is based on selected parts of the following books: J. Kraus, Electromagnetics; L. Match and J. Morgan, Electromagnetic and Electromechanical Machines; B. S. Guru, Electric Machinery and Transformers; and N. Mohan, T. Undeland, and W. Robbins, Power Electronics.

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

BL30A1030 Electrical Machines

BL30A1030 Electrical Machines

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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 Janne Nerg, Responsible teacher
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Locations: Lappeenranta and Lahti

Prerequisites

EN: It is recommended that students have prior knowledge of electromagnetism and the basics of electrical machines.

Learning outcomes

EN: Upon completion of the course, the student will be able to:
1. Understand the structure and operating principles of various electrical machine topologies.

2. Select an appropriate electrical machine topology for a given application.

3. Explain the process of torque production in electrical machines.

4. Apply the principles of electrical machine sizing.

5. Understand the fundamentals of electrical machine windings.

6. Identify and utilize key materials used in magnetic circuits and windings.

7. Grasp the fundamental principles of rotating electrical machine design.

8. Perform basic calculations related to electrical machines.

Content

EN: Classification of electrical machines, the electromagnetic principles governing the operation and dimensioning of electrical machines, the windings of an electrical machines, performance calculation of electrical machines.

Additional information

EN: The course is related to UN's Sustainable Development Goals (SDG): 7 affordable and clean energy, 8 decent work and economic growth, 9 industry, innovation and infrastructure, 12 responsible consumption and production, and 13 climate action.

Study materials

EN: Lecture materials in Moodle. The course is based on suitable parts of Pyrhönen, Jokinen, Hrabovcova: Design of Rotating Electrical Machines

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

BL30A1040 Electrical Drives 1

BL30A1040 Electrical Drives 1

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
Credits	4 cr
Languages	English
Grading scale	Pass-Fail
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LES, Electrical Engineering 100%
Responsible persons	Minna Loikkanen, Administrative person Ilya Petrov, Responsible teacher Daniil Zadorozhniuk, Responsible teacher Tuomo Pälvilä, Responsible teacher
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Equivalences to other studies

BL30A1020 Electrical Drives, Compact

Equivalences (free text field)

EN: Replaces the course BL30A1020 Electrical Drives, Compact 4 ECTS.

Learning outcomes

EN: Upon completion of the course the student will be able to: 1. understand the role of electrical drives, 2. understand different torque producing principles in different machines, 3. model and simulate a DC motor drive, 4. describe the principles of scalar, vector and direct torque control of rotating field machines, 5. define the most important power electronic converters, 6. discuss the principles of PWM, space vector modulation and DTC. 7. model the behaviour of permanent magnet synchronous machine by using vector equivalent circuits and vector diagrams.

Content

EN: Theory of electric motor drives, operation and vector equivalent circuits. Torque production in different machines. Power electronic converters suitable for motor and generator drives. Scalar control, vector control, direct flux linkage control and direct torque control (DTC). Permanent magnet synchronous machine drives.

Additional information

EN: The course is related to UN's Sustainable Development Goals (SDG): 7 affordable and clean energy, 13 climate action, 15 life and land.
AI can be used in solving the tasks but not allowed in the Exam

Study materials

EN: Pyrhönen, Juha, Valeria Hrabovcová, and Scott Semken. Electrical Machine Drives Control#: An Introduction. Chichester, England: Wiley, 2016

Literature

Pyrhönen, Juha, Valeria Hrabovcová, and Scott Semken. Electrical Machine Drives Control#: An Introduction. Chichester, England: Wiley, 2016

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

BL30A1050 Electrical Drives 2

BL30A1050 Electrical Drives 2

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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	Ilya Petrov, Responsible teacher Minna Loikkanen, Administrative person Daniil Zadorozhniuk, Responsible teacher
Study level	Advanced studies

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

Learning outcomes

EN: Upon completion of the course the student will be able to: 1. model the behaviour of permanent magnet synchronous machine by using vector equivalent circuits and vector diagrams, 2. understand synchronous machine control in details, 3. understand synchronous reluctance machine control in details, 4. understand the role of induction machine and its control in details, 5. know the switched reluctance machine control principles, 6. discuss the adverse effects of PWM systems on motor behaviour and the wave nature of the motor cable. Mastering the course material well gives the student comprehensive understanding of the basics of electrical drives and wide possibilities to work in the field. This is the course for drives professionals.

Content

EN: Theory of electric motor drives, operation and vector equivalent circuits. Synchronous machine drives, asynchronous machine drives, synchronous reluctance machine drives, permanent magnet synchronous machine drives, switched reluctance motor drives. Torque production in different machines. Power electronic converters suitable for motor and generator drives. Vector control, direct flux linkage control and direct torque control (DTC). Motor cable wave nature, bearing currents. Applying the principles for practical electrical machine types.

Additional information

EN: The course is related to UN's Sustainable Development Goals (SDG): 7 affordable and clean energy, 13 climate action, 15 life and land
AI can be used in solving the tasks but not allowed in the Exam

Study materials

EN: Lecture material in the course based on the book: Pyrhönen, Juha, Valeria Hrabovcová, and Scott Semken. *Electrical Machine Drives Control#: An Introduction*.

Literature

Pyrhönen, Juha, Valeria Hrabovcová, and Scott Semken. Electrical Machine Drives Control#: An Introduction. Chichester, England: Wiley, 2016

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

BL30A1300 Power Electronic Converters

BL30A1300 Power Electronic Converters

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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 Pasi Peltoniemi, Responsible teacher

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

Prerequisites

EN: Recommended: BL30A0000 Electric Circuits. Integration and derivation (esp. sine and cosine functions). FFT. Laplace transforms. Basic software skills with Excel, Word, Matlab/Simulink.

Equivalences to other studies

BL30A0901 Power Electronic Components

Learning outcomes

EN: Upon completion of the course the student will be able to: 1. demonstrate good general knowledge of the selected different basic main circuits in modern power electronics, 2. describe the features and functions of selected rectifiers, switch-mode converters and inverters, 3. calculate and simulate typical design tasks of the aforementioned circuits, 4. describe the joint operation of power electronic converters and loads as well as some network interferences caused by converters and some alternatives to reduce these interferences.

Content

EN: Operation of the main circuits of different power converters: rectifiers (single and three-phase), DC-DC switch mode converters, inverters (single and three-phase). Characteristics and operation. Pulse width modulation (PWM). Harmonic components. Simulation of power electronic circuits.

Additional information

EN: Company cooperation
-

Use of AI applications

Artificial intelligence applications can be used according to general policies of LUT, for example, for creating a big picture and structuring things, creating and sketching ideas, understanding concepts and searching for information within constraints, and improving grammar, text and style according to the assignment.

Study materials

EN: Mohan, Undeland, Robbins: Power Electronics, converters, applications, and design.
The learning material is based on the latest research and is distributed to students 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

BL40A0510 Digital Control 1

BL40A0510 Digital Control 1

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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 Tuomo Lindh, Responsible teacher Miisa Lopperi, Responsible teacher
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Prerequisites

EN: BL40A0200

Learning outcomes

EN: Upon completion of the course the student will be able to: 1. write the state equations of the system and use them to analyze the behavior of the system, 2. discretize the state-space model and the transfer function model and explain the pole mapping from continuous Laplace domain to discrete z-domain, 3. analyze the properties of the discrete system and examine its stability and behavior using Bode and Nyquist diagrams or root locus, 4. design a continuous time controller that meets the given specifications and discretize it by using an appropriate approximation, 5. discretize the given specifications and design directly a discrete controller, 6. program a digital controller and system model.

Content

EN: Basics of sampling theory and discrete modelling, discrete transfer function, continuous time and discrete state model. Sampled-data systems. Basics of state-space representation. Frequency response of discrete system,root-locus. Stability and performance of a discrete system. Basic digital control algorithms and their tuning. Practical aspects of implementations of digital controllers. Direct compensator design, Dead-beat controller Two-degree of freedom control. Observers and state-feedback.
Use of AI applications:

AI may be used for information gathering but is prohibited for any other purpose. Copy-pasting from sources is not allowed
unless explicitly permitted for a specific task. In Moodle exams, AI usage results in rejection of the exam.

Additional information

EN: DSG:S are : '7 affortable and clean energy' and ' 8 Decent work and economic growth'

Study materials

EN: All course material in Moodle including edited lecture videos. Presentation slides and matlab scripts in Moodle. One book from the following list is recommended.Ioan D. Landau and Gianluca Zito, Digital Control Systems, Design, Identification and Implementation.Franklin, Powell, Workman, Digital Control of Dynamic Systems.Åström, Wittenmark, Computer Controlled Systems.Kuo, Digital Control Systems, 2nd edition.

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

BL40A1101 Embedded System Programming

BL40A1101 Embedded System Programming

Curriculum period	2025-2026
Validity period	since 1 Aug 2025

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 Tuomo Lindh, Responsible teacher Anna Tupitsina, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Prerequisites

EN: Basics of C language. Basics of embedded systems recommended.

Learning outcomes

EN: Upon completion of the course the student will be able to: 1. apply C language and its structures to embedded system programming, 2. form complex data types such as structures, unions and buffers and use these in order to maintain information of different entities (e.g.processing units), 3. control the registers of a micro controller using C-language, 4. use different PUs of a micro controller, 5. Take into use a real time operation system.

Content

EN: Design tools, C-language in embedded system programming, utilization of a micro controller environment (registers, timers, buses, A/D conversion etc.). Typical data structures, typical program structures in real-time applications.
Use of AI applications:
AI may be used for information gathering but is prohibited for any other purpose. Copy-pasting from sources is not allowed
unless explicitly permitted for a specific task. In Moodle exams, AI usage results in rejection of the exam.

Additional information

EN: Student needs a Digilent Zybo Z7 SOC-board or alternatively Nucleo F411RE board. Digilent Zybo Z7 boards are available in classroom during exercises.
Full digi.

The course is related to UN's Sustainable Development Goals (SDG): 7 affordable and clean energy, 8 decent work and economic growth

Study materials

EN: The Zynq Book: http://www.zynqbook.com. Lecture notes. Additional reading:B. W. Kernigan, D. M. Ritchie, The C Programming Language.Compiler and C library manuals, processor datasheets, peripheral datasheets.

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

BL40A2055 Wireless Communications

BL40A2055 Wireless Communications

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
Credits	8 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LES, Electrical Engineering 100%
Responsible persons	Pedro Juliano Nardelli, 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: digital signal processing (Fourier transform), probability theory (random variables) and scientific computing (python)

Equivalences (free text field)

EN: Wireless Communications (8 ECTS) can be used to replace Wireless Communication Systems (4 ECTS), Wireless Communication Networks (4 ECTS) tai Laboratory Course in Wireless Communication Systems and Networks (4 ECTS).

Learning outcomes

EN: After the course, the student will acquire the basic understanding of wireless communication systems, namely:
1) Ways to handle the challenge of multiple access of the shared wireless medium;

2) Principles of layering and slicing based different network functionalities and application services;

3) Fundamentals of digital communications: modulation, coding, and fundamental limits;

4) Roles of time, frequency and space in wireless communications;

5) Performance analysis of communication systems;

6) Wireless connectivity as an enabler of cyber-physical systems.

Content

EN: 1) Access of shared wireless medium;
2) Layers for different network functionalities and slices for different application requirements;

3) Digital modulation, communication channels, demodulation, and coding: designing principles and fundamental limits;

4) Time, frequency and space in wireless communications: orthogonality, propagation, and multiple antennas;

5) Performance analysis of communication systems using ns3 simulator;

6) Wireless communications as an enabler of cyber-physical systems.

Note: The use of generative tools (the so-called artificial intelligence or simply AI) are discouraged as the proposed tasks are designed for human learning; nevertheless the so-called AI applications can still be used according to general LUT policies.

Additional information

EN: The course is related to UN's Sustainable Development Goals (SDG): 9 industry, innovation and infrastructure, 11 sustainable cities and communities, and 12 responsible consumption and production.
NOTE: Wireless Communications (8 ECTS) can not be included in the degree together with Wireless Communication Systems (4 ECTS), Wireless Communication Networks (4 ECTS) or Laboratory Course in Wireless Communication Systems and Networks (4 ECTS).

Study materials

EN: Textbook, simulations in python and ns3 produced by the teachers and other suggested materials.

Literature

Popovski, Petar. Wireless Connectivity: An Intuitive and Fundamental Guide. John Wiley & Sons, 2020. Available at LUT Primo.

https://www.wiley.com/en-us/Wireless+Connectivity:+An+Intuitive+and+Fundamental+Guide-p-9780470683996

https://www.nsnam.org/

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	8 cr
Course Completion		8 cr
Method 2	Recurrence 1: 1. period-2. period	8 cr
Course Completion		8 cr

BL40A2810 Automation

BL40A2810 Automation

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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 Tuomo Lindh, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Prerequisites

EN: Basics of programming.

Learning outcomes

EN: Upon completion of the course the student will be able to:
1. Program controllers using IEC61131-3 languages.

2. Connect IO devices to an automation system.

3. Use the analog and digital communication techniques that are applied in automation.

4. Apply automation and digital control theory to practical implementations by constructing controllers and modeling dynamic systems using IEC 61131-3 languages.

5. Collaborate effectively in a team to solve automation and control problems.

Content

EN: IEC61131-3 programming languages, Different POUs (programs, functions and function blocks), Sensors, Automation hardware and software. Fieldbuses. Utilization of Simulink models in PLC systems. C/C++ languages in PLC systems. HMI, OPC, IoT in automation. Introduction to safety in automation.
Use of AI applications:

AI may be used for information gathering but is prohibited for any other purpose. Copy-pasting from sources is not allowed
unless explicitly permitted for a specific task. In Moodle exams, AI usage results in rejection of the exam.

Additional information

EN: Full digi, except for two days in lab at Lappeenranta Campus.
The course is related to UN's Sustainable Development Goals (SDG): 7 affordable and clean energy, 8 decent work and economic growth

Study materials

EN: Presentation slides and videos at Moodle.Karl-Heinz John, Michael Tiegelkamp.IEC 61131-3: Programming Industrial Automation Systems.e-ISBN 978-3-642-12015-2.Springer Handbook of Automation.Possible other e-books available in Finna.Other on-line resources.

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

BL50A1402 Analog Electronics 2

BL50A1402 Analog Electronics 2

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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 Mikko Kuisma, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Prerequisites

EN: BL50A0101 Analogiaelektroniikka 1/Analog Electronics 1 recommended.

Learning outcomes

EN: Upon completing the course, the student will be able to:
Apply the fundamental components of analog electronics and their operating principles in designing practical circuit solutions.

Utilize small-signal models and simulation to analyze and troubleshoot the operation of transistor amplifiers.

Design amplifiers that incorporate operational amplifiers and specialized analog circuits, and evaluate their performance.

Explain how feedback, noise, and distortion affect an amplifier’s performance, and apply feedback techniques in amplifier design.

Explain the differences between various classes of power amplifiers (A, B, AB, D) and select an appropriate power amplifier for a specific application.

Implement analog circuits in accordance with given design requirements using circuit simulation tools, and compare simulation results with measured values.

Content

EN: Analysis of diodes and transistors, biasing of transistor amplifiers, and analysis using small-signal models and circuit simulation tools. Characteristics of practical operational amplifiers and their impact on amplifier design. The principles of feedback and its application in amplifier design. Noise and distortion. Linear power supplies and power amplifiers. Specialized analog circuits and their applications. Design and simulation of analog circuits using a SPICE simulator. The utilization of artificial intelligence in circuit design and documentation. Practical laboratory measurements.

Additional information

EN: Blended learning. Problem-based learning.
***
The course is related to UN's Sustainable Development Goals (SDG):

7 affordable and clean energy, 9 industry, innovation and infrastructure.

Analog electronics plays an important role in all stages of electrical system: production, transmission, storage and end use. Good electronics design can prolong lifecycle of devices and help reduce the energy consumption.

Study materials

EN: Electronic Devices, Thomas L. Floyd
Microelectronics, Jacob MillmanMicroelectronic circuits, Sedra & Smith

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

BH10A1900 Fundamentals of Energy Technology

BH10A1900 Fundamentals of Energy Technology

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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

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	2025-2026
Validity period	since 1 Aug 2025
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

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	2025-2026
Validity period	since 1 Aug 2025
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

Prerequisites

EN: BH40A1401 - Fluid Mechanics I or equivalent knowledge
BH40A1453 - Fluid Mechanics II or equivalent knowledge

LES10A260 - Technical Computing Software or equivalent knowledge

Equivalences to other studies

BH40A1700 Numerical Methods in Heat Transfer

Learning outcomes

EN: This course introduces students to the fundamentals of Computational Fluid Dynamics (CFD) simulations and key numerical methods in heat and mass transfer.
Students will learn to independently analyze fluid dynamics problems, select appropriate models and methods, perform simulations, interpret results, and troubleshoot issues.

Using CFD software, students will design simple engineering flow problems.

The course enhances skills in mathematics, practical application of theories, communication, independent work, problem-solving, time management, and task prioritization.

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. Initial and boundary conditions. Linear solvers. Solution algorithms for steady and unsteady problems. 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

6 clean water and sanitation

7 affordable and clean energy

9 industry, innovation and infrastructure

11 sustainable cities and communities

13 climate action

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	2025-2026
Validity period	since 1 Aug 2025
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

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 Registration		0 cr
Course Assessment		6 cr

BH50A1300 Maintenance Management

BH50A1300 Maintenance Management

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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

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 Registration		0 cr
Course Assessment		4 cr

BH50A1400 Steam Boilers

BH50A1400 Steam Boilers

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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 Falah Alobaid, Responsible teacher Juha Kaikko, Responsible teacher
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

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 Registration		0 cr
Course Assessment		6 cr
Method 2	Recurrence 1: Summer	6 cr
Course Assessment		6 cr
Course Registration		0 cr

BH61A0600 Bioenergy

BH61A0600 Bioenergy

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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

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 Registration		0 cr
Method 2	Recurrence 1: 1. period	3 cr
Course Assessment		3 cr
Course Registration		0 cr

BH70A0200 Advanced Topics in Modelling of Energy Systems

BH70A0200 Advanced Topics in Modelling of Energy Systems

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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

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	2025-2026
Validity period	since 1 Aug 2025
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

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 Registration		0 cr
Course Assessment		6 cr

BH60A0252 Solid Waste Management Technology

BH60A0252 Solid Waste Management Technology

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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 Ishika Weerawardhana, Responsible teacher Mariam Abdulkareem, Responsible teacher
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

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	2025-2026
Validity period	since 1 Aug 2025
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

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	2025-2026
Validity period	since 1 Aug 2025
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 Mukesh Basnet, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Equivalences (free text field)

EN: BH60A4400 Introduction to Sustainability

Learning outcomes

EN: After successfully completing the course, students are able to:

1) Explain the core idea and thinking behind sustainability, and 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) Understand the importance 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) Reflect on sustainability principles and gain basic understanding of sustainability transitions.

Content

EN: The general objective of the course is to provide a comprehensive overview of the concepts of sustainability, sustainable business, and sustainable transition generally and especially in the socio-technological context. The course introduces the global sustainability challenges that the planet and societies are facing and understands the need for a sustainability transition. A future negotiation-learning approach is applied in the course.
Key themes:

- Sustainability and society

- Socio-technical systems

- Sustainability transitions

Additional information

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

Study materials

EN: Will be provided 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	2025-2026
Validity period	since 1 Aug 2025
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

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	2025-2026
Validity period	since 1 Aug 2025
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 Husain Patel, Responsible teacher
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

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.
Course relates to UN Sustainable development goals (SDG): 6 clean water and sanitation, 7 affordable and clean energy, 11 sustainable cities and communities, 13 climate action

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	2025-2026

Validity period	since 1 Aug 2025
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	Mohammad Naji Nassajfar, Responsible teacher Annukka Ilves, Administrative person Laura Lakanen, Responsible teacher
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

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

BH60A5401 Introduction to Circular Economy

BH60A5401 Introduction to Circular Economy

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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

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

CS10A0864 Research Methods in Management

CS10A0864 Research Methods in Management

Abbreviation: RM

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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

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. (2023). Research methods for business students, 9th ed. Harlow, England; New York: Pearson.
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	2025-2026
Validity period	since 1 Aug 2025
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

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	2025-2026
Validity period	since 1 Aug 2025
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

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	2025-2026
Validity period	since 1 Aug 2025
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 Armi Rissanen, Administrative person Zahra Honarmand Shahzileh, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

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 here .

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	2025-2026
Validity period	since 1 Aug 2025
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

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

CS30A1372 Creative Design and Problem Solving

CS30A1372 Creative Design and Problem Solving

Curriculum period	2025-2026
Validity period	1 Aug 2025-31 Dec 2025
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

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 Registration		0 cr
Method 2	Recurrence 1: 1. period-2. period	6 cr
Course Assessment		6 cr
Course Registration		0 cr

CS39A0221 Technology design for disability and inclusion

CS39A0221 Technology design for disability and inclusion

Abbreviation: Tech for disability

Curriculum period	2025-2026
Validity period	1 Aug 2025-31 Dec 2025
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: PLEASE NOTE: This course is self-study but IT HAS AN END DATE. At the moment, you are not able to complete it all year round
PLEASE ALSO NOTE: if you attended the bachelor course CS39A0210 disability & access, this course highly overlaps with it and it might not be worth it to attend it again

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. Neurodiversi-

ty 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	2025-2026
Validity period	since 1 Aug 2025
Credits	3 cr
Languages	English
Grading scale	Pass-Fail
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

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, differential equations 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
Course Completion		3 cr

CS30A0820 The Dark Side of Sustainability

CS30A0820 The Dark Side of Sustainability

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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 civil, 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 and prevent 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 of different stakeholders 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-2. period	3 cr
Course Completion		3 cr

CS40A0170 Interdisciplinary Course on Sustainable Finance

CS40A0170 Interdisciplinary Course on Sustainable Finance

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
Credits	5-6 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 Marko Torkkeli, Responsible teacher Maria Nemilentseva, Responsible teacher
Study level	Intermediate studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Learning outcomes

EN: After having completed the course, student are able to:
- explain UN Agenda 2030 and 17SDGs, discuss various perspective of sustainability-related issues and analyse own sustainability-related decision-making situations

- discuss and argue the role of technology and innovation in development of new products and sustainable development

- define key concepts of finance

- define Sustainable Finance and analyse the principles of sustainable finance, including ESG factors

- know sustainable finance regulation and frameworks

- understand corporate sustainability and reporting

- differentiate innovative financial instruments and assess the effectiveness of sustainable finance initiatives

- assess the role of technological integration in sustainable finance

Content

EN: The Interdisciplinary course on Sustainable Finance aims to bridge the gap between engineering and business students to develop transdisciplinary skills necessary to solve sustainable finance issues. The course includes the next parts: 1) 21-day challenge (compulsory for 6 ECTS); 2) Principles of Finance (for Engineering students) **OR** Technology and Innovation for Sustainability (for business students); Quantitative analysis; 3) In-depth focus on Sustainable Finance

Additional information

EN: This is a transdisciplinary course on Sustainable Finance that aims to provide knowledge on sustainable development and sustainable finance to both engineering and business (finance) students.
The course is fully online without onsite lectures.

Study materials

EN: Lecture slides, videos and other distributed material.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	5-6 cr
Participation in teaching		5-6 cr

BK10A3801 Principles of Industrial Manufacturing Processes

BK10A3801 Principles of Industrial Manufacturing Processes

Abbreviation: PoIMP

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
Credits	7 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 Mikael Ollikainen, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Learning outcomes

EN: Upon completion of this course, students will be able to:

- Manufacturing process fundamentals: Identify, describe, and compare various manufacturing processes, including machining (turning, milling, etc.), sheet metal production (cutting, bending, forming, joining), additive manufacturing, common welding processes, and packaging.
- Machining Expertise: Master the fundamentals of machining, including parameters, cutting tools, forces, fluids, chips, fixtures; manufacture machined products or manage their procurement; analyze cost structures; and understand/mitigate waste generation.
- Sheet metal production: Understand the complete sheet metal product process, including cutting, punching, bending, forming (including special methods), and joining techniques.
- Composites fundamentals & materials: Define composite materials, differentiate between types (particle, fiber, structural, bio, and WPC), explain the advantages/disadvantages of natural vs. synthetic fibers,

and describe key chemical/physical properties of natural fibers (cellulose, lignin, aspect ratio, moisture) and common thermoplastics used in WPCs (melting point, mechanical properties).
- WPC manufacturing processes: Describe and understand the steps involved in key WPC manufacturing techniques, including compounding, extrusion, injection molding, compression molding, and 3D printing.
- Applications and scope: Identify a wide range of applications for WPCs and natural fiber composites across various industries.
- Understand the packaging industry and its context: Define the fundamental roles and functions of packaging, encompassing product protection, preservation, communication, convenience, and environmental considerations. Explain packaging from diverse perspectives, incorporating materials science, machinery, printing/converting, product knowledge, and the influence of business models, consumer behavior, environmental issues, and regulations
- Describe packaging materials and manufacturing processes: Describe common packaging materials, including fiber-based materials, various plastic types, metal, and glass, outlining their properties and applications. Explain the manufacturing and converting processes for various packaging types.
- Design and manage packaging production: Comprehend key factors in designing new packaging lines, such as production volumes, cost analysis, efficiency, and the crucial role of material runnability. Explain various maintenance paradigms for packaging equipment, including reactive, preventive, and predictive maintenance, analyzing their benefits and drawbacks.
- Master the laser fundamentals and technologies: Understand the core principles of photonic digital manufacturing, including additive manufacturing (3D printing) and laser-based processes, and classify the various AM technologies. This includes identifying system components, understanding process parameters, and differentiating between various laser types and their applications.
- Analyze industrial applications and impact in AM: Evaluate the practical applications of photonic digital manufacturing across industries, with a particular focus on the automotive sector. This includes analyzing case studies, assessing the impact on product design, supply chains, business models, and understanding the economic, lifecycle, and environmental considerations.
- Explore advanced concepts and future trends in additive manufacturing: Investigate advancements in photonic digital manufacturing, including new materials, automation, simulation-driven design, large-scale additive manufacturing, and quality assurance techniques.
- Define welding concepts: Understand core welding terminology and processes(MMA, GMAW, FCAW, SAW, GTAW, Plasma).
- Assess HS/UHSS weldability: Identify challenges and considerations for welding high strength/ultra-high strength steels and understand relevant welding standards for them
- Apply welding design principles: Design welded structures using HS/UHSS, accounting for strength and distortion.
- Describe welding production processes: Outline the steps in welding production and quality control.
- Explain supply chains in welding: Understand the importance of collaboration in the welding supply chain.
- Recognize digital impact: Appreciate the role of digital technologies in modern welding.
- Safe work in welding: Know safe work methods in welding.

Content

EN: This course covers a wide range of manufacturing and engineering topics, including the fundamentals of sheet metal fabrication, material selection, basic processing operations (cutting, punching, bending), and traditional joining methods. Cutting and machining are explored, detailing steel fabrication, cutting parameters, tool wear, and common machining operations like turning, milling, and drilling. Sustainable manufacturing highlights strategies for improving product sustainability. The study of composite materials delves into fundamental principles, classifications, and the advantages/disadvantages of natural fibers, with a specific focus on Wood-Plastic Composites (WPCs), including their chemical composition, properties, manufacturing processes, and applications. Packaging engineering and technology encompasses the entire packaging value chain, material types (fiber-based, plastic, metal, glass), manufacturing processes, environmental impact, and regulatory compliance. Laser and additive technologies are covered in depth, including the principles of photonic digital manufacturing, various additive manufacturing (AM) technologies (especially for metals), industry standards, system components, process parameters, laser types, applications (particularly in automotive), case studies, economic/environmental considerations, and cutting-edge

advancements. Welding is examined, covering terminology, processes (MIG/MAG, TIG, SAW), joint types, weld characteristics, the challenges and advantages of welding High-Strength/Ultra-High-Strength Steels (HS/UHSS), design for welding (considering static/fatigue strength, distortion, tolerances), manufacturing and quality control (production planning, inspection, work instructions), the role of digital supply chains, real-world case studies, and safety considerations.

The course includes a reverse engineering group project.

Topics covered:

Sheet metal:

- Sheet metal materials
- Basic sheet metal processing operations like cutting, punching, bending, and folding.
- Traditional mechanical joining methods (with additional elements).

Cutting and machining:

- Steel fabrication processes.
- Basics of cutting parameters and tool selection.
- Tool Wear
- Basic machining operations, such as external and internal turning, milling, drilling, sawing, grinding

- Sustainable Manufacturing:
- Strategies for improving the sustainability of products through manufacturing processes.

Composite materials:

- Fundamental principles of composite production, including reinforcement and matrix phases.
- Classification of composites (particle-reinforced, fiber-reinforced, structural).
- Advantages and disadvantages of using natural fibers in composites.
- Chemical composition and properties of natural fibers (cellulose, lignin, etc.).
- Types of thermoplastics used in WPCs and their properties.
- Compatibility issues between fibers and polymers and methods for improvement (e.g., coupling agents).
- WPC manufacturing processes: compounding, extrusion, injection molding, compression molding, and 3D printing.
- Mechanical and physical properties of WPCs, including weathering and durability.
- Applications of WPCs in various industries.

Packaging engineering and technology:

- Overview of the packaging industry, covering the entire value chain from material production to end-of-life considerations.
- Key topics include: the functions and requirements of packaging (with a focus on food packaging); analysis of the global packaging market and industry trends.
- In-depth study of fiber-based, plastic, metal and glass packaging materials
- Detailed examination of manufacturing processes such as converting, forming, filling, and sealing; and the design, operation, and maintenance of packaging lines.
- Environmental impact, sustainability, logistics, and regulatory compliance

Laser and additive technologies

- Understand the core principles of photonic digital manufacturing, including additive manufacturing (3D printing) and laser-based processes.
- Understand the different AM technologies suitable for metal.
- Classify the various AM technologies according to industry standards (ISO/ASTM 52900:2015).
- Identify system components, understanding process parameters, and differentiating between various laser types and their applications.
- Evaluate the practical applications of photonic digital manufacturing across diverse industries, with a particular focus on the automotive sector.

- Analyze case studies, assessing the impact on product design, supply chains, business models.
- Understand the economic, lifecycle, and environmental considerations of these technologies.
- Investigate the cutting-edge advancements in photonic digital manufacturing, including new materials, automation, simulation-driven design, large-scale additive manufacturing, and quality assurance techniques.

Welding:

- Terminology, processes (MIG/MAG, TIG, SAW, etc.), joint types, weld characteristics.
- HS/UHSS: Advantages, challenges, and the impact of welding on these materials.
- Design for Welding (HS/UHSS): Static/fatigue strength, distortion, tolerances.
- Manufacturing & Quality: Production planning, inspection, and the role of work instructions.
- Digital supply chain: Optimization through digital tools, data, and real-time monitoring.
- Case Studies: Real-world applications and problem-solving.
- Safety in welding.

Additional information

EN: The content of the course is designed from the perspective of the United Nations Sustainable Development Goals (UN SDG´s) and its content contributes to the Sustainable Consumption and Production Objectives 9 (Industry, Innovation, and Infrastructure) and 12 (Responsible Consumption and Production). The proposed concrete actions aim to reduce the adverse environmental impacts of production and consumption by presenting various sustainable solutions to future production challenges. This will ensure both sustainable production and a sustainable value chain in the future, resulting in end-customers receiving sustainably manufactured products.

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	7 cr
Independent study		7 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	2025-2026
Validity period	since 1 Aug 2025
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

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 reliability 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
Artificial intelligent tool is allowed to be used in this course to collect information, it is forbidden for writing purpose.

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

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

BK70A0001 Simulation of a Mechatronic Machine

BK70A0001 Simulation of a Mechatronic Machine

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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

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 Completion		5 cr
Method 2	Recurrence 1: 1. period-2. period	5 cr
Course Completion		5 cr

BK70A0600 Computational Methods in Mechanics

BK70A0600 Computational Methods in Mechanics

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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 Aleksandr Nemov, Responsible teacher
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Tweet text

EN: Learn computational methods in mechanics—from programming to numerical analysis & simulation. Applications in multibody dynamics, PDEs, & industry innovation.

Prerequisites

EN: Students are expected to have basic skills in programming and matrix calculus. Prior experience in kinematics and dynamics is recommended but not required.

Learning outcomes

EN: By the end of the course, students will have acquired practical experience with computational methods commonly used in mechanics. Special emphasis will be placed on the numerical analysis of kinematics and dynamics in vibrating and rigid multibody systems.
Students will develop an understanding of the fundamental theory behind these systems and the numerical techniques used to analyze them. Topics covered will include solving nonlinear equations, working with sparse and dense linear algebra, and integrating equations of motion.

Additionally, the course will emphasize good programming practices. Students will learn how to write efficient, clear, and maintainable engineering code using high-level linear algebra tools such as MATLAB.

Content

EN:

- Best practices for writing correct and efficient code in MATLAB, including debugging techniques.
- Identification of common coding mistakes and strategies for improvement.
- Numerical solutions for the equations of motion in vibrating and multibody systems.
- Numerical integration of ordinary differential equations (ODEs) and differential-algebraic equations (DAEs).
- Explicit and implicit integration methods, including constraint stabilization techniques.
- The Newton-Raphson method for solving nonlinear systems of equations.
- Numerical methods for solving partial differential equations (PDEs) relevant to mechanics.
- Introduction to unit testing for verifying computational implementations.

Additional information

EN: This course aligns with UN Sustainable Development Goal 9: Industry, Innovation, and Infrastructure by equipping students with computational tools essential for advancing engineering innovation. Through numerical methods and programming techniques, students will develop skills applicable to designing and analyzing efficient mechanical systems, contributing to sustainable technological progress.

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	2025-2026
Validity period	since 1 Aug 2025
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 Juho Bonifer, 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	2025-2026
Validity period	since 1 Aug 2025
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 Giota Goswami, Responsible teacher

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

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

BK80A1403 Fatigue

BK80A1403 Fatigue

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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	Masoud Moshtaghi, Responsible teacher Annukka Ilves, Administrative person Edris Dabiri, Responsible teacher Mahdieh Safyari, Responsible teacher Antti Ahola, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

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 Registration		0 cr

BK20A3200 Welding Quality and Economy

BK20A3200 Welding Quality and Economy

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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

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	2025-2026
Validity period	since 1 Aug 2025
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	2025-2026
Validity period	since 1 Aug 2025
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 Marika Hirvimäki, Responsible teacher Sami Westman, Responsible teacher Vesa Tepponen, Responsible teacher
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

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

FY30A1000 Introduction to Particle Physics

FY30A1000 Introduction to Particle Physics

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
Credits	5 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Physics 100%
Responsible persons	Jonna Naukkarinen, Administrative person Henning Kirschenmann, Responsible teacher
Study level	Advanced studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Prerequisites

EN: Special relativity, classical quantum mechanics and introduction modern physics and structure of matter. For the experimental analysis, Python or another similar programming language.

Learning outcomes

EN: After this course, the students should be able to:
1. Explain the basic theoretical and experimental concepts in particle physics (in writing)

2. Calculate the rate of a particle interaction or decay process and explain their thought process clearly (by pen and paper)

3. Analyse a set of experimental data (with a computer)

These ILOs cover the basic professional skills of experimental and theoretical particle physicists, who need to be able to analyse data with both theory knowledge and computing skills, and be able to discuss the results in context using the specific concepts of particle physics.

Content

EN: This course offers a comprehensive introduction to the fundamental concepts of particle physics, bridging both theoretical foundations and experimental analysis. Students will explore the core principles of special relativity and quantum mechanics as they apply to particle interactions and decays, while gain-

ing hands-on experience in data analysis using Python or similar programming languages. Topics include decay rates, cross-sections, the Dirac equation, Feynman diagrams, and deep inelastic scattering, providing a strong foundation for further studies in experimental and theoretical particle physics.

Underlying concepts [special relativity, quantum mechanics]
Decay rates and cross sections [Lorentz-invariance, matrix element]

The Dirac equation [relativistic QM => spin + antimatter]

Interaction by particle exchange [Feynman diagrams]

Electron-positron annihilation [calculations in perturbation theory]

Electron-proton elastic scattering [form factor]

Deep inelastic scattering [Bjorken x, PDFs]

(*Symmetries and the quark model)

Additional information

EN: ***
The course is related to UN's Sustainable Development Goals (SDG): 4 quality education, 9 industry, innovation and infrastructure, 12 responsible consumption and production

Study materials

EN: Course book is "Modern Particle Physics" by Mark Thomson. This course covers chapters 1-8.
Additional material will be made available in the form of slides and self-study videos/quizzes.

More recommended literature:

- F. Halzen, A.D. Martin, ***Quarks and Leptons*** , John Wiley & Sons 1984.
- D. Griffiths, ***Introduction to elementary particles***, John Wiley & Sons 1987.
- M. Peskin, D. Schroeder, ***An Introduction to Quantum Field Theory***, Westview Press 1995.
- I. Aitchison, A. Hey, *Gauge Theories in Particle Physics*, Taylor & Francis 2004.
- A. Seiden, *Particle Physics: A Comprehensive Introduction*, Addison-Wesley 2004.
- O. Nachtmann, *Elementary Particle Physics*, Springer-Verlag 1990.

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

CT60A5103 Software Engineering Models and Modeling

CT60A5103 Software Engineering Models and Modeling

Abbreviation: CT00CM03

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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)

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	2025-2026
Validity period	since 1 Aug 2025
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)

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	2025-2026
Validity period	since 1 Aug 2025
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)

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	2025-2026
Validity period	since 1 Aug 2025
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	2025-2026
Validity period	since 1 Aug 2025
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)

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. Students may take this as online self-study throughout the year. The lecture-based approach is available for students only in the spring semester. It has mandatory sessions held on the Lappeenranta campus.

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	2025-2026
Validity period	since 1 Aug 2025
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 (fall, spring), while in online mode, students follow videos and other material provided on moodle pages (fall, spring, summer). 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	2025-2026
Validity period	since 1 Aug 2025
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)

Prerequisites

EN: Bachelor's thesis or degree completed.

Learning outcomes

EN: After the course, students will have expertise in the fundamental principles of key enabling pillars and platforms for digital business. They should understand how different platforms will add value to digital business and how data analytics may enhance the value of heterogeneous data. Moreover, students shall get an understanding of the role of stakeholders, technology and business challenges for being able to build a customer-centric culture and customer understanding. Students shall get encouraged to further master digital business platform concepts to help them re-engineer existing services, business processes and create new digital services.

Content

EN: 1. INNOVATIONS AND ECOSYSTEMS

- Closed innovation
- Open Innovation
- Ecosystems for innovation

2. MARKET MODELS

- Pipeline model
- Two-sided markets
- Platform attributes

3. LAUNCHING PLATFORM

- Chicken-or-egg problem
- Monetization/Commercialization
- Openness

4. COMPETITION LANDSCAPE

- Competing in platform economy
- Competing threads
- Digital platform competitiveness

5. DATA ECONOMIES

- Power of data in platform economy
- Data network effects
- Data handling risks

6. DIGITAL SERVITIZATION

- Product vs. Service
- Everything as a Service
- Product based platforms

Additional information

EN: Priority given to Digital Transformation students.
The course is related to UN's Sustainable Development Goals (SDG): 9 industry, innovation and infrastructure, 12 responsible consumption and production

Study materials

EN: Required reading:

- Platform Revolution: How Networked Markets Are Transforming the Economy - And How to Make Them Work,', by G. Parker, M. Van Alstyne, S. Choudary, 2016.
- Digital Platforms: A Review and Future Directions, Asadullah, Ahmad; Faik, Isam; and Kankanhalli, Atreyi, PACIS 2018 Proceedings. 248. 2018.
- Introduction—Platforms and Infrastructures in the Digital Age, by Panos Constantinides, Ola Henfridsson, Geoffrey G. Parker, Information Systems Research, 2018

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	2025-2026
Validity period	since 1 Aug 2025
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 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

CT80A0300 Software and Application Innovation

CT80A0300 Software and Application Innovation

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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), Engineering, manufacturing and construction

Equivalences (free text field)

EN: Course is equivalent to CS30A7402 Software and Application Innovation.

Learning outcomes

EN: At the end of this course students will be able to:

1. Identify and conceptualize an opportunity for innovation in the selected field
2. Identify the technical possibilities and limitations in the selected field
3. Demonstrate the knowledge and skills of innovation methods in creation of new meaningful software solutions and applications based on some technology

4. Demonstrate good team working skill in developing and presenting the new innovation.

Content

EN: Theme of the course changes on a yearly basis. This course combines technology and technology management perspectives for cross-scientific approach in software and application innovation process.
Course consists of

- Basics and use cases of the selected theme and related technologies
- User-centric needs based design in software and application development
- Innovation management, idea generation and opportunity identification process
- (Open) business models and technology commercialization in global markets
- Product and service development

Additional information

EN: The sustainability links in this course depend on which SDG students select to focus on.

Study materials

EN: Drucker P., The discipline of innovation, Harvard Business Review, August 2002.
Buur J., Matthews B., Participatory Innovation, International journal of innovation management, Vol. 12, No. 3, 2008.

Technical material focusing on the theme of the year will be announced on the Moodle pages of the course.

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

CT60A5401 Game Development Project

CT60A5401 Game Development Project

Abbreviation: CT00CL92

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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 Jussi Kasurinen, 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.

Learning outcomes

EN: Intended Course Learning Outcomes. At the end of this course students will be able to:
1. Conduct independent work in entertainment software engineering context.
2. Independently design and implement a small-scale game program with some industry-relevant platform.
3. Acquiring further knowledge concerning the taught game development tool.
4. Working as a productive member and as part of a team developing larger entertainment software product.

Content

EN: Applied software engineering course. The objective for this course is for students to learn how to use their software engineering knowledge in an entertainment software engineering context. With the selected game development tools, student is capable to independently design and develop a small game program on some modern game engine platform, or work as a part of a team developing a larger game product.
List of Topics: lectures and project works:
- Games as software products
- Basics of processes and models applied in the entertainment software industry
- Basics of the game development tools
- Introduction to game engines and their functions
- Basics of 3D objects
- Introduction to game development-related programming problem.
- Basics of artificial intelligence in entertainment software engineering context.
- Basics of sound engineering
- Gamification and Serious games.

Additional information

EN: Anytime-course. The course can be started at any point of the year, and you have 90 days from the start to complete the course assignments.
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: Based on the yearly implementation, the taught game engine tutorials and other materials given during the course.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: Summer, Summer, 1. period-4. period	6 cr
¤LAB/LUT: Course Completion		6 cr

CT80A0000 Data-Intensive Systems

CT80A0000 Data-Intensive Systems

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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)

Prerequisites

EN: Recommended: Basics of database systems or equivalent, Distributed Systems or equivalent, Fundamentals of Programming or equivalent.
For Master's students only.

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

LES10A170 Applied Mathematics I

LES10A170 Applied Mathematics I

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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	Paula Immonen, Responsible teacher Annukka Ilves, Administrative person Minna Loikkanen, Administrative person Aleksi Mankonen, Responsible teacher Juho Ratava, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Prerequisites

EN: Recommended: Basics of calculus and programming, introduction to Matlab.

Recommended prerequisites

LES10A140 Engineering Mathematics 3

LES10A160 Technical Computing Software

or

LES10A030 Engineering Mathematics 2

LES10A040 Introduction to Computational Science

or

LES10A220 Engineering Mathematics III

LES10A260 Technical Computing Software

Equivalences (free text field)

EN: This course may replace BK20A1501 Numeeriset menetelmät I for LES students.

Learning outcomes

EN: After completing the course, the student knows the numerical methods for solving linear and nonlinear equations and estimating derivatives and integrals. The student can apply these skills to solve engineering problems involving differential equations and optimization problems numerically. The student can document their problem-solving process. The student may familiarize themselves in the use of AI in assisting technical problem-solving, programming and technical writing.

Content

EN: Rehearsal of calculus and other basics as necessary. Numerical differentiation and integration, numerical solutions of linear and nonlinear equations and systems of equations, differential equations, and numerical optimization with applications in design and engineering problems.
Company cooperation

It is possible to do the course project with a company.

Use of AI applications

Use of AI applications to assist problem-solving, programming and improving the student's own writing

Additional information

EN: Presence in exercise/tutorial sessions is advantageous, but it is possible to complete the course remotely with reasonable effort.
The course is related to the following UN Sustainable Development Goals (SDG): 4 quality education, 5 gender equality, 7 affordable and clean energy, 9 industry, innovation and infrastructure, 10 reduced inequalities

Study materials

EN: Lecture notes and other materials will be provided during the course.

Literature

Valentine, D.T. & Hahn, B.T.: Essential MATLAB for Engineers and Scientists. 3rd ed. Amsterdam; Butterworth Heinemann, 2007
Kreyszig, E.: Advanced Engineering Mathematics (any edition). Wiley.

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

A380A0320 Applied Consumer Behaviour

A380A0320 Applied Consumer Behaviour

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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 Claudio Piccolo, Responsible teacher
Study level	Intermediate studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law

Prerequisites

EN: Basics of marketing (Markkinoinnin perusteet).
Recommended prerequisite course for students of SIB-programme: A130A0420 Research Methods in Business Studies.

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 consumer data.

· Collect and analyze quantitative consumer data using the statistics software R.

· Interpret the results of a consumer research project and reflect on their academic and practical implications.

· Work effectively and systematically on a consumer 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). Statistical analysis of consumer data with R.

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 lectures and seminars require physical presence in Lappeenranta.
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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	2025-2026
Validity period	since 1 Aug 2025
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

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	2025-2026
Validity period	since 1 Aug 2025
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	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

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, 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	2025-2026
Validity period	since 1 Aug 2025
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

Study level	Intermediate studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law

Prerequisites

EN: A130A0350 Kvantitatiiviset tutkimusmenetelmät (Quantitative Research Methods).

Learning outcomes

EN: The course introduces business students to the core concepts of algorithmization and programming, to give the students the needed background to start using procedural and object-oriented programming languages for business analytics purposes. 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. Be able to structure problems and break them up into subparts, that can potentially be solved or approached through already available techniques and tools. Modularization and procedural thinking will be developed during the course.
3. Be able to apply basic algorithmic structures (loops, logical conditions, recursive algorithms, sorting algorithms, ...) in general in problem solving tasks and in a chosen programming language.

As such the course aims to develop student competences and skills to be able to implement a simple, but complete data analysis process in a chosen programming language or in pseudocode for solution planning purposes. Specific examples from the business analytics context concerning, for example, data scraping, data cleaning and pre-processing, data analytics using statistical methods, data visualization and machine learning will be provided.

Content

EN: Basics of programming and algorithmic thinking and its implementation in programming languages used in practical business analytics - both procedural and object-oriented (e.g. Pseudocode, Matlab, Python, R, etc.) - and their application in business analytics problems. This involves 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 problem structuring, modularization and basics of programming) and on examining business-related problems with real world data.

Additional information

EN: Blended - on campus delivery combined with Datacamp learning platform
Other additional information

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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	2025-2026
Validity period	since 1 Aug 2025
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 Suvi Tiainen, Administrative person
Study level	Intermediate studies
Study field	Fields of education (Ministry of Education and Culture), Business, administration and law

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 has three assignments: Individual self-reflection assignment (30 points), Group Assignment - Case Study (Presentation-10 points, Report-30 points), electronic individual exam (30 points).

Participation: the course assumes in-person, face-to-face participation as a B.Sc. level course. Participation on the group work presentation day and e-exam is mandatory.

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.
- Schmid, S. (2018). *Internationalization of Business*. Springer International Publishing.
- 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	2025-2026
Validity period	since 1 Aug 2025
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

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.
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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	2025-2026
Validity period	since 1 Aug 2025
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

- 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. 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.
The course is related to UN's Sustainable Development Goals (SDG): Not relevant

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 Registration		0 cr
Course Assessment		6 cr
Method 2	Recurrence 1: 1. period-2. period	6 cr
Course Registration		0 cr
Midterm Exam 1		0 cr
Midterm Exam 2		6 cr

A250A0620 Fundamentals of Accounting and Finance

A250A0620 Fundamentals of Accounting and Finance

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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

Learning outcomes

EN:
Upon completing this course, students will achieve the following learning outcomes:

- Establish a solid foundation in accounting and finance to support informed decision-making.
- Learn fundamental principles of financial and managerial accounting.
- Understand the financial statements and apply ratio analysis.
- Develop an understanding of cost accounting and its role in business operations.
- Gain a skillset in the valuation of major asset classes and their risk-return characteristics.
- Learn the principles of Modern Portfolio Theory and its applications in investment decisions.

Content

EN: The course covers key areas of accounting and finance, including financial and managerial accounting principles, financial statement preparation and analysis, cost accounting and budgeting, corporate finance fundamentals, valuation of cash flows and financial assets, capital structure and payout policy, risk and return concepts, short-term finance and working capital management, and long-term financial decision-making.

Additional information

EN: The course is related to UN's Sustainable Development Goals (SDG): 16 peace, justice and strong institutions

Study materials

EN:
Lecture notes and the following recommended textbooks:

- Financial Accounting (11th Edition or newer) by Libby, Libby, and Hodge
- Managerial Accounting (17th Edition or newer) by Garrison, Noreen, and Brewer
- Principles of Corporate Finance (13th Edition or newer) by Brealey, Myers, and Allen

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	2025-2026
Validity period	since 1 Aug 2025
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 Mariana Galvão Lyra, Responsible teacher Outi Behm, Responsible teacher
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 – global economy, free trade, sustainable business, and global south-north differences – requiring an ethical and sustainable approach to management and leadership. The course is highly interactive, connecting theory and practice through inviting industry guests as well as a team workshop carried out by an external lecturer.

Additional information

EN: Priority is given to B.Sc. of Sustainable international business programme students.

The course is part of the UN's Sustainable Development Goals (SDG): 8,9 and 17.

Study materials

EN:

- Kinicki, A., & Williams, B. K. (2024). Management: A practical introduction. McGraw-Hill.
- Lecture slides
- Additional materials: in class and Moodle

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

BL10A0102 Basics of Electrical Engineering

BL10A0102 Basics of Electrical Engineering

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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 Mehar Ullah, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

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.
Use of AI applications:Artificial intelligence applications can be used according to general policies of LUT.

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 cr
¤LUT/LAB: Course Completion		2 cr

BL20A0710 Introduction to Electrical Power Systems

BL20A0710 Introduction to Electrical Power Systems

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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

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.
Company co-operation

No company co-operation

Use of AI applications

AI applications can be used for understanding concepts and searching for information, taking into account the constraints of the AI in source criticism. Students have to provide the answers in weekly assignments by own produced text. Students are not allowed to present AI-generated text as their own.

Additional information

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

7 affordable and clean energy

Study materials

EN: E-book: Electric power systems by Weedy, Brian B.
Additional learning material (lecture slides) is based on the latest research and is distributed to students in Moodle.

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

BL30A0510 Introduction to Electrical Drives

BL30A0510 Introduction to Electrical Drives

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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

Prerequisites

EN: Recommended: BL 10A0102 Basics of Electrical Engineering, BL30A0000 Electric Circuits completed and BL30A0300 Electromagnetism attended.

Recommended prerequisites

BL30A0001 Electric Circuits

BL30A0300 Electromagnetism

BL10A0102 Basics of Electrical Engineering

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, asynchronous 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: 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: The study materials are based on research and distributed to students in Moodle. Including lecture and exercise materials. 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	2025-2026

Validity period	since 1 Aug 2025
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

BL40A0130 Measurement and Control Systems

BL40A0130 Measurement and Control Systems

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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 Mohammad Khan, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Prerequisites

EN: Basics of differential equations, basics of complex numbers.

Learning outcomes

EN: A student will be able to:

- Assess the suitability of measurement equipment for a given application based on available information and estimate its measurement uncertainty.
- Select appropriate components for a measurement system and develop a measurement plan.
- Derive differential equation-based models for simple dynamic systems.
- Convert differential equations into state-space representations.
- Determine transfer functions from differential equations.
- Analyze the stability of dynamic systems using standard methods.

- Evaluate the dynamic behavior of first- and second-order systems and adjust their response using basic controllers.

Content

EN: Basic terms describing the static and dynamic characteristics of measurement systems, Measurement accuracy, uncertainty, sensor principles, and digitization of measurement signals, Dynamic modeling of linear systems, including transfer functions and analysis in the Laplace domain, Core concepts of control engineering, including compensators and controllers, The relationship between time and frequency domains in system analysis, Analytical methods for controller tuning, State-space representations of dynamic systems, Application of MATLAB and Simulink for solving control problems.

Additional information

EN:

- Hybrid course organized both in Lappeenranta and Lahti (locally/remotely)
- Use of AI tools: According to the university regulations
- The course is related to the UN's Sustainable Development Goals (SDG): 7 affordable and clean energy

Study materials

EN: The learning material is based on the latest research and is available to students through Moodle.

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

BL40A1732 Digital Electronics

BL40A1732 Digital Electronics

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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 Lauri Järvinen, Responsible teacher Mohammad Khan, Responsible teacher
Study level	Intermediate studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Prerequisites

EN: Basic Electronics

Equivalences to other studies

BL40A1730 Digital Design

Learning outcomes

EN: By the end of this course, students will be able to:
· Explain the fundamental concepts of digital number representation and Boolean algebra.

· Design and analyze combinational logic circuits consisting of basic components like gates, multiplexers, and decoders.

· Explain the principles of sequential logic consisting of flip-flops and counters.

· Explain the basics of processor operating principles, architecture,

· Explain embedded systems, including common peripherals and memory types.

· Describe programmable logic devices and their applications.

· Design, simulate, and implement simple digital systems.

Content

EN: Digital representations and number systems. Logic circuit implementation, gates, sequential logic. Memory and processor architecture basics. Embedded systems with microcontrollers and I/O interfaces. Programmable logic devices.

Additional information

EN:

- Course is related to the UN Sustainable Development Goals (SDG): 7 affordable and clean energy
- Use of AI applications should be according to the university regulations.

Study materials

EN: The learning material is based on the latest research and is distributed to students in Moodle

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

BL40A5000 Principles of C-Programming

BL40A5000 Principles of C-Programming

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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 Mehar Ullah, Responsible teacher
Study level	Basic studies

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

Prerequisites

EN: No any prerequisite required for this course

Equivalences to other studies

LES10A110 Principles of C-programming

Learning outcomes

EN: Student who successfully complete the course will demonstrate the following outcomes:
1. Applies basic concepts, such as flow control, loops, understands concepts of procedural and object-oriented programming;
2. Understands basic commands, data types/structures, and libraries;
3. Structures the program to make it efficient, understandable, maintainable, and extendable;
4. Understands memory management principles such as static or dynamic allocation;
5. Understands fundamentals of computer architecture and is familiar with von Neumann architecture.
6. Understands disassembly listings of C programs and can debug programs execution using the listing and step by step tracing in a debug/simulated environment.
7. Understands operations occurring in linking process and can read and modify existing link scripts for gcc linker.

8. Understands file handling (opening, reading, writing and closing files)

Content

EN: Introduction to C-programming , syntax, variables, data types, data structures, flow control, loops, functions, pointers and memory management, file input/output, string operations, memory management, good programming practices, make, gcc, core principles of computer architecture and RISC-V assembler, file handling

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
- There might be slight changes in course contents during the course according to the requirements
- Course will be in person at Lappeenranta campus and if needed will be streamed to the other campuses.
- AI tools can only be used according to the university rules (https://elut.lut.fi/en/completing-studies/rules-and-regulations/ai-based-tools-policies)

Study materials

EN: Lecture slides, video materials in Moodle, book "Modern C for Absolute Beginners second edition by Slobodan Dmitrovic"

Literature

Lecture slides will be used in Moodle and also we will use some videos to explain different topics. The book used in this course is "Modern C for Absolute Beginners second edition by Slobodan Dmitrovic" and is available on the LUT.primo "https://lut.primo.exlibrisgroup.com/view/action/uresolver.do?operation=resolveService&package_service_id=4138188870006254&institutionId=6254&customerId=6245&VE=true".

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

BH20A0720 Engineering Thermodynamics

BH20A0720 Engineering Thermodynamics

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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

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 Completion		6 cr
Method 2		6 cr
Course Completion		6 cr

BH61A0000 Fundamentals of Energy Economics

BH61A0000 Energiatalouden johdantokurssi

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
Credits	2 cr
Languages	English, Finnish
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 Raghu KC, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Learning outcomes

EN: Upon completion of the course the student will be able to: 1. apply alternative investment calculation methods in energy investments, 2. calculate the energy contents of fuels in different energy units, 3. describe the fundamentals of energy production methods and the applicable fuel options, 4. describe the grounds for the fuel price determination, and 5. identify the grounds for the security of energy supply.

Content

EN: Finnish energy economics. Principles of investment calculation methods. Main energy units and heat value of fuels. Energy chain of fuels. Principles and efficiencies of energy production methods. Fuel prices and the effect of emission trading. Maintenance and delivery reliability.

Additional information

EN: The implementation in Finnish is lectured in Lappeenranta and it is meant for all the other students but B.Sc. DD.
The implementation in English is lectured in Lahti and is meant for the students of the B.Sc. DD programmes taught in English only.
The course is related to UN's Sustainable Development Goals (SDG): affortable and clean energy, decent work and economic growth, industry, innovation and infrastucture, sustainable cities and communities, climate action

Study materials

EN: The learning material is based on the latest research and is distributed to students in Moodle.

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

Course Assessment	2 cr
Course Registration	0 cr

BH40A0710 Measurements in Energy Technology

BH40A0710 Measurements in Energy Technology

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
Credits	2 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 Pekka Punnonen, Responsible teacher Maria Olkku, Responsible teacher
Study level	Intermediate studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Learning outcomes

EN: Upon completion of the course the students will be able to 1. recognize temperature, pressure, mass and volume flow, flow velocity and air humidity measurements devices in related to energy technology processes, 2. performance practical calculation needed in measurements,
and 6. understand basics of uncertainty of measurements.
Completion of the course supports the development of the following generic competences for working life: mathematics and natural sciences, practical application of theories

Content

EN: Examples of measurements in Energy Technology. Physical quantities and units. Least squares method (LSM). Temperature and pressure measurements. Flow and velocity measurements. Shaft power measurement and air humidity measurements. Flow visualization. Introduction to uncertainty of measurements.

Additional information

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

7 affordable and clean energy, 9 industry, innovation and infrastructure.

Study materials

EN: Venkateshan S.P. (2022). Mechanical Measurements.
Stephanie Bell (1999). A Beginner's Guide To Uncertainity of Measurement. National Physics Laboratory.

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

BH60A7200 Circular.now

BH60A7200 Circular.now

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
Credits	3 cr
Languages	English, Finnish
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

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.

Company collaboration: The course utilizes video material recorded in collaboration with companies, showcasing real circular economy solutions across various industries.

Artificial intelligence: all kind of AI tools, including excess use of translation tools, is forbidden and will lead to failing the course.

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	2025-2026
Validity period	since 1 Aug 2025
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

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, 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
Method 5	Recurrence 1: 2. period, 4. period	5 cr
Course completion in Finnish		5 cr
Method 6	Recurrence 1: 2. period, 4. period	3 cr
Course completion in Finnish		3 cr
Method 7		3 cr
Course Completion in English		3 cr
Method 8		3 cr
Course completion in Finnish		3 cr
Method 9		5 cr
Course completion in English		5 cr
Method 10		5 cr
Course completion in Finnish		5 cr

LES10A020 Engineering Physics

LES10A020 Engineering Physics

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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 Mikko Äijälä, Responsible teacher Paula Immonen, Responsible teacher Ayesha Sadiqa, Responsible teacher Cassia Santos Nunes Almeida, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

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

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.

Halliday, D., Resnick, R., & Walker, J. (2013). Fundamentals of physics. John Wiley & Sons.

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	2025-2026
Validity period	since 1 Aug 2025
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

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 Registration		0 cr
Course Assessment		3 cr

LES10A210 Engineering Mathematics II

LES10A210 Engineering Mathematics II

Abbreviation: LES10A210 EMII

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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 Juho Ratava, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

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 Registration		0 cr
Course Assessment		3 cr

LES10A410 Engineering Project Work

LES10A410 Engineering Project Work

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Compulsory 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 and to optimize the design of final product
- 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 while also reporting the main results related to the prototype development/testing

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
Course Completion		5-10 cr

BK10A6202 Mechatronics

BK10A6202 Mechatronics

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
Credits	5 cr
Languages	English, Finnish
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

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 Registration		0 cr
Method 2	Recurrence 1: 1. period-2. period	5 cr
¤LAB/LUT: Course Registration		0 cr
¤LAB/LUT: Midterm Exam 1		0 cr
¤LAB/LUT: Midterm Exam 2		5 cr
Method 3	Recurrence 1: 1. period-2. period	5 cr
¤LAB/LUT: Course Assessment		5 cr

¤LAB/LUT: Course Registration 0 cr
Method 4 Recurrence 1: 1. period-2. period 5 cr
¤LAB/LUT: Course Registration 0 cr
¤LAB/LUT: Midterm Exam 1 0 cr
¤LAB/LUT: Midterm Exam 2 5 cr

BK10A7300 Machine Elements and Principles

BK10A7300 Machine Elements and Principles

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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
Study level	Intermediate studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Compulsory prerequisites

BK10A6300 Engineering Design

BK80A4000 Engineering Mechanics I

BK80A4010 Engineering Mechanics II

or

BK10A5800 Engineering Mechanics 1

BK80A4010 Engineering Mechanics II

BK10A6300 Engineering Design

or

BK80A4000 Engineering Mechanics I

BK10A6000 Engineering Mechanics 2

BK10A6300 Engineering Design

or

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.

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

BK10A6400 Basics of FE-Analysis

BK10A6400 Basics of FE-Analysis

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
Credits	4 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LES, Mechanical Engineering 100%
Responsible persons	Marko Matikainen, Responsible teacher Annukka Ilves, Administrative person Antti Ahola, Responsible teacher Changyang Li, Responsible teacher
Study level	Intermediate studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Prerequisites

EN: BK10A6000 Engineering Mechanics 2 completed

Equivalences to other studies

BK80A2800 FE-analysis, Elementary Course

Learning outcomes

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

- Understand the mathematical and physical foundations of the displacement-based Finite Element (FE) method.
- Analyze statically loaded mechanical structures using both MATLAB and commercial FE analysis software.
- Solve eigenvalue problems of mechanical structures using MATLAB and commercial FE analysis software.
- Utilize Large Language Models (LLMs) and other AI-based tools to develop and code a basic FE solver in MATLAB.
- Assess the robustness, accuracy, and efficiency of FE solutions.

Content

EN: The objective of the lectures is to impart a fundamental understanding of the elemental stiffness matrices for rod, beam, and solid structures, the assembly of the global stiffness matrix, the imposing of boundary conditions and loads, and the solution strategies for both static and linearised dynamic problems analysed using the finite element method. The exercises will introduce FE analysis using commercial FE software.

Additional information

EN: ***
The course is related to UN's Sustainable Development Goals (SDG): 9 Industry, Innovation and Infrastructure, 11 Sustainable Cities and Communities, 12 Responsible consumption and Production, 13 Climate Action, 17 Partnerships for the Goals

Study materials

EN: Lectures notes in the Moodle.

Literature

Cook, Robert D., Finite element modeling for stress analysis
Hughes, Thomas J.R., Finite Element Method: Linear Static And Dynamic Finite Element Analysis
Hakala M.K., Lujuusopin elementtimenetelmä.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period-2. period	4 cr
¤LAB/LUT: Course Registration		0 cr
¤LAB/LUT: Course Assessment		4 cr
Method 2	Recurrence 1: 1. period-2. period	4 cr
¤LAB/LUT: Course Registration		0 cr
¤LAB/LUT: Course Assessment		4 cr

CT30A3232 Basics of Linux

CT30A3232 Basics of Linux

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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)

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.

AI applications may be to understand the material, but the answers to the assignments to be submitted must be achieved through independent work.

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	2025-2026
Validity period	since 1 Aug 2025
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)

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 involved. 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: You may use AI applications to understand the material, but the answers to the assignments to be submitted must be achieved through independent work.

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 Assessment		3 cr
Course Registration		0 cr
Method 2	Recurrence 1: 1. period	3 cr
Course Assessment		3 cr
Course Registration		0 cr

CT70A9111 Software Development Skills: Front-End

CT70A9111 Software Development Skills: Front-End

Abbreviation: CT00CM00

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
Credits	1 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)

Prerequisites

EN: CT30A2803 User Interfaces and Usability

CT60A0203 Introduction to Programming (or equivalent)

Compulsory prerequisites

CT30A2804 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	1 cr
¤LAB/LUT: Course Completion		1 cr

CT70A9140 Software Development Skills: Full-Stack

CT70A9140 Software Development Skills: Full-Stack

Abbreviation: CT00CM01

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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)

Prerequisites

EN: CT30A2803 User Interfaces and Usability
CT60A0203 Introduction to Programming

CT60A2411 Object-Oriented Programming

CT60A4304 Basics of Database Systems
(or equivalent)

Compulsory prerequisites

CT30A2804 User Interfaces and Usability

CT60A0203 Fundamentals of Programming

CT60A2412 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	2025-2026
Validity period	since 1 Aug 2025
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)

Prerequisites

EN: CT30A2803 User Interfaces and Usability
CT60A0203 Introduction to Programming (or equivalent)

Compulsory prerequisites

CT30A2804 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	2025-2026
Validity period	since 1 Aug 2025
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: The basic course of web development

Compulsory prerequisites

CT60A0203 Fundamentals of Programming

or

CT60A0250 Fundamentals of Programming for international programs

Recommended prerequisites

CT60A2412 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
¤LUT/LAB: Course Completion		3 cr

CT70A9150 Introduction to DevOps

CT70A9150 Introduction to DevOps

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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)

Prerequisites

EN: Basics of Linux (or equivalent knowledge),CT60A0203 Introduction to Programming

Recommended prerequisites

CT30A3232 Basics of Linux

CT60A0203 Fundamentals of Programming

Learning outcomes

EN: At the end of the course the student will be able to:
1. Design and implement repositories for software engineering projects

2. Understand how the evolution of development practices led to DVCS and DevOps

3. Understand and solve issues related to versioning and deployment

4. Set up continuous deployment pipeline

5. Implement testing and other deployment processes as a part of a DevOps process

Content

EN: Distributed version control systems (DVCS). Modern repository hosting platforms, such as GitHub and GitLab. Repository best practices, management, and administration. Solving repository errors. Continuous deployment processes and executing tests. Basics of container platforms, such as Docker. Deploying basic applications from source control systems.

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: Tutorial videos, online readings, and other material assigned at the course.

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

VT10A1400 Environmental Communication

VT10A1400 Environmental Communication

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
Credits	5 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Social Sciences 100%
Responsible persons	Tarja Pettinen, Administrative person Iina Hellsten, Responsible teacher
Study level	Intermediate studies
Study field	Fields of education (Ministry of Education and Culture), Social sciences

Learning outcomes

EN: After completing the course, the students:
Can describe the main theoretical strands of environmental communication

Have acquired skills to communicate about environmental issues

Content

EN: The course focuses on the main strands of environmental communication covering environmental risks such as ozone hole depletion, biodiversity loss, and climate change as well as the main measures to counter environmental risks. The course consists of hybrid teaching with recorded lectures, on-campus lectures and online exercises.

Additional information

EN: ***
The course is related to the UN Sustainable Development Goals (SDG): Not relevant

Study materials

EN: Course literature is to be announced in the beginning of the course.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 1. period Recurrence 2: 3. period	5 cr
Course Completion		5 cr

VT10A1500 Political Communication, Social Movements and Activism

VT10A1500 Political Communication, Social Movements and Activism

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
Credits	5 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LENS, Social Sciences 100%
Responsible persons	Tarja Pettinen, Administrative person Kaisa Pekkala, Responsible teacher
Study level	Intermediate studies
Study field	Fields of education (Ministry of Education and Culture), Social sciences

Learning outcomes

EN: After completing the course, the student will:
· Understand the role of political communication, social movements, and activism in society.

·Understand the key concepts and research directions in political communication and social movement research.

·Be able to identify and examine current phenomena in the field

Content

EN: The course focuses on how societal influence is exercised through communication. It examines political communication and its key concepts and theories. Students will also explore social movements and activism as forms of influence. The course will look at current phenomena in political communication and the role of social movements and activism in contemporary society.

Completion method and assessment items	Recurrence	Credits
Method 1	Recurrence 1: 2. period Recurrence 2: 4. period	5 cr
Course Completion		5 cr

BK10A1201 Research Methods and Methodologies

BK10A1201 Research Methods and Methodologies

Abbreviation: BK00CE20

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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	Katriina Mielonen, Responsible teacher Annukka Ilves, Administrative person
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Engineering, manufacturing and construction

Prerequisites

EN: BSc degree

Equivalences to other studies

BK10A1700 Research Methods JEDI

Learning outcomes

EN: After having passed this course module the student is able to:
- Plan and organize the research project according to the established scientific practices and procedures

- To apply triangulation in the research projects in the field of mechanical engineering and evaluate the reliability aspects of the research including the viewpoints of reliability, validity, sensitivity, error analysis, accuracy and saturation

- Compare, choose and utilize proper scientific practices to carry out research projects in industrial environments especially in the field of mechanical engineering including the aspects related to sustainable development goals (SDG) and the applications of P2X

- Write and present a scientific research plan and a research report according to the IMRAD principle and C.A.R.S. model.

Content

EN: Learning outcomes:
The learning outcomes of this course are mostly related to support research activities in the field of mechanical engineering. The main learning outcomes are as follows:

- Criteria to evaluate the scientific contribution of research

- Scientific research projects especially in mechanical engineering

- Principles of qualitative and quantitative analysis

- Reliability aspects and utilization of triangulation especially for research work in the field of mechanical engineering

- Viewpoints on how to illustrate the results of quantitative analysis

- Different means to carry out literature reviews, interviews and surveys

- Utilization of silent knowledge

- Contents and structures of research plans and reports s based on the IMRAD principle and C.A.R.S. model

Additional information

EN: This course is only for mechanical engineering students.
Detailed instructions and timetables for each degree programs (JEDI, IDE, Mechatronis Lahti and face-to-face students at LUT) will be given in Moodle environment.

Participation to the contact teaching days in Lappeenranta or Lahti is obligatory.

The course is related to UN's Sustainable Development Goals (SDG): 6 clean water and sanitation, 7 affordable and clean energy, 12 responsible consumption and production and 13 climate action.

Study materials

EN: Lectures and other material available in Moodle.
David V. Thiel, Research Methods for Engineers 1st Edition; Cambridge University Press; 2014, ISBN-13 : 978-1107610194, ISBN-10 : 1107610192

Dipankar Deb, Rajeeb Dey, Valentina E. Balas; Engineering Research Methodology - A Practical Insight for Researchers, Springer 2019, ISBN-978-981-13-2946-3

For Finnish students see also: Eskelinen and Karsikas, Tutkimusmetodiikan perusteet - Tekniikan alan oppikirja, Tammertekniikka, 2014.

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

VA10A1500 Introduction to Entrepreneurship

VA10A1500 Johdatus yrittäjyyteen

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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%
Responsible persons	Satu Vesin, Responsible teacher Markku Ikävalko, 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: 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 and social sciences.

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.

1. The course will run from 2 October to 1 December 2025 (Weeks 40–49). There is a pre-assignment in week 38.

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	2025-2026
Validity period	since 1 Aug 2025
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 2026 (Weeks 40–47). There is a pre-assignment in Week 40.
The second course period runs from late January to mid March 2026 (Weeks 4–11). There is a pre-assignment in Week 4.

The third course period runs from mid March to mid May 2026 (Weeks 12–19). There is a pre-assignment in Week 12.

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

K200CE69 Finnish 1

K200CE69 Finnish 1

Abbreviation: K200CE69

Curriculum period	2025-2026
Validity period	since 1 Aug 2025

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	Sanna Paunonen, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Humanities

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	2025-2026
Validity period	since 1 Aug 2025
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	Sanna Paunonen, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Humanities

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	2025-2026
Validity period	since 1 Aug 2025
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), Humanities

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	2025-2026
Validity period	since 1 Aug 2025
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), Humanities

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	2025-2026
Validity period	since 1 Aug 2025
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), Humanities

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

K200CG35 Finnish for Work 2

K200CG35 Finnish for Work 2

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
Credits	5 cr
Languages	English, 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), Humanities

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	2025-2026
Validity period	since 1 Aug 2025
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), Humanities

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	2025-2026
Validity period	since 1 Aug 2025
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), Humanities

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	2025-2026
Validity period	since 1 Aug 2025
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), Humanities

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

K200DE18 Suomi with Love 2

K200DE18 Suomi with Love 2

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
Credits	3 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LAB, language 100%
Responsible persons	
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Humanities

K200CS72 Independent study in Finnish

K200CS72 Independent study in Finnish

Abbreviation: K200CS72

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
Credits	2 cr
Languages	English, Finnish
Grading scale	Pass-Fail
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), Humanities

Prerequisites

EN: Details available in Completion methods under the header Teaching

Learning outcomes

EN: Proficiency level B1 The students will be able to - read a text in his/her field in order to understand its main idea - use the most important Finnish concepts in his/her field both in speech and in simple texts - knows enough vocabulary in his/her field to be able to follow a lesson or lecture in Finnish and under-

stand its main points - make use of tools to explain new concepts - can plan language learning independently and assess his/her own progress.

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

KE00BZ84 English for Professional Development (Business)

KE00BZ84 English for Professional Development (Business)

Abbreviation: KE00BZ84

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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), Humanities

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	2025-2026

Validity period	since 1 Aug 2025
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), Humanities

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	2025-2026
Validity period	since 1 Aug 2025
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), Humanities

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	2025-2026
Validity period	since 1 Aug 2025
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), Humanities

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	2025-2026

Validity period	since 1 Aug 2025
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), Humanities

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	2025-2026
Validity period	since 1 Aug 2025
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), Humanities

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		2 cr
¤LAB/LUT: Course Completion		2 cr

KE00CG79 Professional Reading

KE00CG79 Professional Reading

Abbreviation: KE00CG79

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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	Matti Mäkelä, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Humanities

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	2025-2026
Validity period	since 1 Aug 2025
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), Humanities

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	2025-2026
Validity period	since 1 Aug 2025
Credits	4 cr
Languages	English
Grading scale	Pass-Fail
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LAB, language 100%
Responsible person	Mohammad Etedali, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Humanities

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	2025-2026
Validity period	since 1 Aug 2025
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), Humanities

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	2025-2026
Validity period	since 1 Aug 2025
Credits	3 cr
Languages	English
Grading scale	General scale, 0-5
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LAB, language 100%
Responsible persons	Anneli Rinnevalli, Responsible teacher Sari Turppo, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Humanities

Prerequisites

EN: Details available in Completion methods under the header Teaching

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

KE00DG83 English and AI: Terminology, Ethics and Writing

KE00DG83 English and AI: Terminology, Ethics and Writing

Abbreviation: KE00DG83

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
Credits	1 cr
Languages	English
Grading scale	Pass-Fail
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), Humanities

Learning outcomes

EN: You are able to:

- define and use key terms of AI in English
- identify AI risks and key points of AI ethics in English
- use AI tools responsibly for professional writing in English

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

KD00CH39 German 1

KD00CH39 Saksa 1

Abbreviation: KD00CH39

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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), Humanities

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	2025-2026
Validity period	since 1 Aug 2025
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), Humanities

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	2025-2026
Validity period	since 1 Aug 2025
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), Humanities

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	2025-2026
Validity period	since 1 Aug 2025
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), Humanities

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	2025-2026
Validity period	since 1 Aug 2025
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), Humanities

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	2025-2026
Validity period	since 1 Aug 2025
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), Humanities

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

KF00CH30 French 1

KF00CH30 Ranska 1

Abbreviation: KF00CH30

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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), Humanities

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	2025-2026
Validity period	since 1 Aug 2025
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), Humanities

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	2025-2026
Validity period	since 1 Aug 2025
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), Humanities

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	2025-2026
Validity period	since 1 Aug 2025
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), Humanities

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	2025-2026
Validity period	since 1 Aug 2025
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), Humanities

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	2025-2026
Validity period	since 1 Aug 2025
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	Jonna Holkeri, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Humanities

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	2025-2026

Validity period	since 1 Aug 2025
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	Jonna Holkeri, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Humanities

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 basic 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	2025-2026
Validity period	since 1 Aug 2025
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	Jonna Holkeri, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Humanities

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 com-

parison, 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	2025-2026
Validity period	since 1 Aug 2025
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), Humanities

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	2025-2026
Validity period	since 1 Aug 2025
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), Humanities

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

KM00BX75 Each one teach one

KM00BX75 Each one teach one

Abbreviation: KM00BX75

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
Credits	3 cr
Languages	English
Grading scale	Pass-Fail
University	Lappeenranta-Lahti University of Technology LUT
Responsible organisation	LAB, language 100%
Responsible person	Tuija Marila, Responsible teacher
Study level	Basic studies
Study field	Fields of education (Ministry of Education and Culture), Humanities

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

KE00CF69 Intercultural Competence and Communication

KE00CF69 Intercultural Competence and Communication

Abbreviation: KE00CF69

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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), Humanities

Prerequisites

EN: Details available in Completion methods under the header Teaching

Learning outcomes

EN: The student is able to: - understand own cultural background and its effect on behaviour and communication. - develop intercultural competence and intercultural communication skills to be able to act effectively in global organizations and cross-cultural environments. - recognize cross-cultural differences and work with them. - understand culture adaptation and adjustment for exchange purposes. - understand the basic concepts of global citizenship and diversity.

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

KE00CH94 Diversity Management and Global Citizenship

KE00CH94 Diversity Management and Global Citizenship

Abbreviation: KE00CH94

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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), Humanities

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

KM00DA70 Multicultural Teamwork and Leadership

KM00DA70 Multicultural Teamwork and Leadership

Abbreviation: KM00DA70

Curriculum period	2025-2026
Validity period	since 1 Aug 2025
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), Humanities

Prerequisites

EN: Details available in Completion methods under the header Teaching

Additional information

EN: First time in academic year 25-26.

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