Catalogue report

LUT School of Energy Systems

Master's Programme in Sustainability Science and Solutions

Master’s Programme in Sustainability Science and Solutions 2018-2019 (120 ECTS cr)

Facts

- Degree Master of Science in Technology (M.Sc. Tech.), (Diplomi-insinööri in Finnish)
- Higher university degree, gives eligibility to apply for scientific doctoral studies
- Extent 120 ECTS credits
- Duration two years, full-time studies of 60 ECTS per academic year.

Learning outcomes of MSc programme in Sustainability Science and Solutions

Students who have completed their M.Sc. (Tech.) degree in Sustainability Science and Solutions are able to:

- take responsibility for managing environmental issues
- take responsibility for developing environmental issues
- anticipate the importance of sustainability challenges in the future
- work as a public environmental authority

Students will

- recognise the most significant environmental impacts of products and processes and their importance in terms of business
- understand the requirements of systemic change
- analyse how competitive in terms of environmental impacts and costs a certain technology, product or service is in different operating environments
- assess the technical possibilities of industrial, service, community, and primary production processes and systems to minimise environmental impacts
- explain the complex interdependencies of both local and global environmental problems
- apply theories and the most recent scientific knowledge to solve problems involving environmental aspects
- work as an environmental expert in a range of decision-making situations and produce and convey information to support stakeholders in environmental decision-making
- adopt and innovate new technical solutions to develop the environmental sector

Degree Structure

The Master's degree (120 ECTS) consists of core studies, specialisation studies, minor studies and free elective studies. The Master's Thesis and Seminar is included in the specialisation studies.

The MSc in Sustainability Science and Solutions is also available as a Double Degree Programme for the students of our partner universities. The Double Degree Programme has a separate degree structure of its own.

See Uni-portal:
Sustainability Science and Solutions

Degree structures

Degree Structure

The Master's degree (120 ECTS) consists of core studies, specialisation studies, minor studies and free elective studies. The Master's Thesis and Seminar is included in the specialisation studies, and the Thesis must be written in English in the programmes taught in English.

Students may choose any minor offered by LUT (check the required prerequisites, if any) or do the minor during exchange abroad (upon application). Students are recommended to choose one of the following minors:

- EnSaM150 Energiatekniikka, laaja (in Finnish) (especially courses Energiajärjestelmien suunnittelun perusteet, Energiajärjestelmien kehitys and Bioenergy and Energy Use in the Forest Industry),
- SaDREE Renewable Energy and Energy Efficiency
- KaSOIbm International Business and Management

Free elective studies can be any courses offered by LUT if the required prerequisites are fulfilled. Studies in other universities/from abroad or a max. of 10 ECTS of internship (BH60A3700 Work Internship in Master's Degree, 2-10 ECTS) may be included upon application, too.

The MSc in Sustainability Science and Solutions is also available as a Double Degree Programme for the students of our partner universities. The Double Degree Programme has a separate degree structure of its own.

See the degree structure for details.

Sustainability Science and Solutions 2018-2019

Degree structure status: accepted

Academic year: 2018-19

Beginning date of the academic year: 01.08.2018

Core Studies (min 31 cr)

YmDCore: Core Studies, 20 - 40 cr
Obligatory Studies 31-41 ECTS cr
BH60A2101: Advanced Course in Life Cycle Assessment, 7 cr
BH60A2701: Energy Efficient Environment, 6 cr
BH60A5700: Business and Sustainability, 6 cr
BH60A5800: Sustainable System Transition, 6 cr
BL20A1400: Renewable Energy Technology, 6 cr
Students, who haven´t done Johdatus ympäristötekniikan opiskeluun, are required to do Introduction to M.Sc. Studies
BH60A4600: Introduction to M.Sc. Studies, 1 cr

Students, who haven´t done BH60A5600 Kestävyysmuutos ja johtaminen, are required to take courses BH60A5200 Introduction to Business and Sustainability and BH60A5300 Introduction to Sustainable System Transition.

BH60A5200: Introduction to Business and Sustainability, 3 cr
BH60A5300: Introduction to Sustainable System Transition, 3 cr

Students, who haven´t done Ympäristötekniikan perusteet, are required to do BH60A4400 Introduction to Sustainability.

BH60A4400: Introduction to Sustainability, 3 cr

Specialisation Studies (min 56 cr)

YmDSusta: Sustainability Science and Solutions, 40 - 70 cr

Obligatory Studies 56 ECTS cr

BH60A5000: Master's Thesis, 30 cr
BH60A0252: Solid Waste Management Technology, 7 cr
BH60A0451: Air Pollution Control, 6 cr
BH60A0652: Sustainable Water Use, 6 cr
BH60A1201: Indoor Climate Management of Buildings, 7 cr

Minor Studies (min 20 cr)

Students may choose any minor studies taught at LUT if the required prerequisites are fulfilled. Students are recommended to choose minor studies Energiatekniikka, laaja (code EnSaM150) (especially courses Energiajärjestelmien suunnittelun perusteet, Energiajärjestelmien kehitys and Bioenergy and Energy Use in the Forest Industry), Renewable Energy and Energy Efficiency (code SaDREE) or International Business and Management (code KaSOIbm).

Free Elective Studies

Choose enough free elective studies to attain the full 120 ECTS cr. Free elective studies can include any courses offered by LUT if the required prerequisites are fulfilled. Students are recommended to include following studies in free elective studies (especially language studies and an internship a maximum of 10 ECTS credits. More information: BH60A3700 Work Internship in Master’s Degree 2-10 ECTS cr.)

YMSSSVal: Free elective studies, 0 - 100 cr

Choose enough free elective studies to attain 120 ECTS cr

A350A0500: Sustainable Strategy and Business Ethics, 3 cr
BH50A0400: Water Treatment, 2 cr
BH60A0150: Project work 1, 2 - 10 cr
BH60A2401: Energy Recovery from Solid Waste, 4 cr
BH60A4301: Environmental Technology Project Work, 2 - 7 cr
BH60A4400: Introduction to Sustainability, 3 cr
BH50A2200: Bioenergy and Energy Use in the Forest Industry, 6 cr
BK50A2701: Selection Criteria of Structural Materials, 5 cr
BL40A2600: Wind power and solar energy technology and business, 5 cr
CS30A1691: Social Sustainability, 6 cr
CS31A0610: Life-Cycle Costing of Investment Projects, 6 cr
CT10A7004: Sustainability and IT, 6 cr
KIEN0017: Academic Writing, 3 cr
KIEN0006: English for Professional Development (Technology), 4 cr
KIEN0015: Effective Presentations, 2 cr
KIEN0013: Meetings and Discussions, 3 cr
BH60A3700: Work internship in Master's degree, 2 - 10 cr

Master's Programme for Double Degree Students/Sustainability Science and Solutions 2018-2019

Degree structure status: accepted

Academic year: 2018-19

Beginning date of the academic year: 01.08.2018

Core Studies

Language Studies (min 0 cr)

Specialisation Studies (min 60 cr)

YmDSustaDD: Sustainability Science and Solutions, Double Degree, 40 - 70 cr
- *Obligatory Studies 60 ECTS cr*
  - BH60A5000: Master's Thesis, 30 cr
  - BH60A4600: Introduction to M.Sc. Studies, 1 cr
  - BH60A0252: Solid Waste Management Technology, 7 cr
  - BH60A0451: Air Pollution Control, 6 cr
  - BH60A0652: Sustainable Water Use, 6 cr
  - BH60A2101: Advanced Course in Life Cycle Assessment, 7 cr
  - BH60A4400: Introduction to Sustainability, 3 cr

Credit Transfer

Free Elective Studies (min 10 cr)

Choose a min. of 10 ECTS cr free elective studies to attain the full 120 ECTS cr. Free elective studies can include any courses offered by LUT if the required prerequisites are fulfilled. Students are recommended to include following studies in free elective studies (especially language studies and an internship a maximum of 10 ECTS credits. More information: BH60A3700 Work Internship in Master’s Degree 2-10 ECTS cr.)

YMSSSDDVal: Free elective studies, 0 - 100 cr
- *Chooose at least 10 ECTS cr from following courses*
  - A350A0500: Sustainable Strategy and Business Ethics, 3 cr
  - BH50A0400: Water Treatment, 2 cr
  - BH60A0150: Project work 1, 2 - 10 cr
  - BH60A4301: Environmental Technology Project Work, 2 - 7 cr
  - BH50A2200: Bioenergy and Energy Use in the Forest Industry, 6 cr
  - BK50A2701: Selection Criteria of Structural Materials, 5 cr
  - BL40A2600: Wind power and solar energy technology and business, 5 cr
  - CS31A0610: Life-Cycle Costing of Investment Projects, 6 cr
  - CT10A7004: Sustainability and IT, 6 cr
  - KIEN0017: Academic Writing, 3 cr
  - KIEN0006: English for Professional Development (Technology), 4 cr
  - KIEN0015: Effective Presentations, 2 cr
  - KIEN0013: Meetings and Discussions, 3 cr
  - BH60A3700: Work internship in Master's degree, 2 - 10 cr

Courses and study modules not included in degree structures

Minor Studies

The extent of the minor is a min. of 20 ECTS. Students may choose any minor offered by LUT (check the required prerequisites, if any) or do the minor during exchange abroad (upon application).

Students may choose any minor studies taught at LUT if the required prerequisites are fulfilled.

Students are recommented to choose one of the following minors:

- EnSaM150 Energiatekniikka, laaja (in Finnish) (especially courses Energiajärjestelmien suunnittelun perusteet, Energiajärjestelmien kehitys and Bioenergy and Energy Use in the Forest Industry),
- SaDREE Renewable Energy and Energy Efficiency
- KaSOIbm International Business and Management

Other minors taught at LUT in the academic year 2018-2019 are:

Energy Technology:
EnSaM100 Energiatekniikka (in Finnish)
EnDSaBT Bio-Energy Technology
EnDMES Modelling of Energy Systems

Mechanical Engineering:
KoDSaKote Konetekniikka (in Finnish)
KoDSaManu Modern Manufacturing
KoDSaMate Advanced Materials Engineering

Electrical Engineering:
SaSaM100 Sähkötekniikka (in Finnish)
SaSaM101 Sähkötekniikka, laaja (in Finnish)
SaDREE Renewable Energy and Energy Efficiency

Industrial Engineering and Management:
TuKSOTekn Tuotantotalous, sivuopinnot muu tekniikka (in Finnish)
TuDSO Tuotantotalous, sivuopinnot laaja (in Finnish)
TuSOEntr Entrepreneurship, minor

Computer Science:
TikSOTite Tietotekniikka (in Finnish)

Business Administration:
KaSOLiik Liiketoimintaoaaminen (in Finnish)

Computational Engineering:
MaKSaM180 Teknillinen matematiikka (in Finnish)
FyKSaM110 Teknillinen fysiikka (in Finnish)
MaKSaHahmo Data-analytiikka (in Finnish)
MaDIntM300 Technomathematics
FyDInt300 Technical Physics
MaDSaCompu Computer Vision and Pattern Recognition

Chemical and Process Engineering:
KeSoM200 Kemia (in Finnish)
KeSoM300 Kemian prosessitekniikka (in Finnish)
KeSoD200 Advanced Water Treatment

KeSOD400 Biobased Chemical Engineering
KeSOD500 Advanced Chemistry

All minor subjects offered in academic year 2018-2019 can be found in the study guide "Minor Studies 2018-2019".

EnSaM150: Energy Technology, extensive, 20 - 25 cr
Valitse energiatekniikan laajaan sivuopintokokonaisuuteen 20-25 op. Esitietovaatimuksena Energiatekniikan sivuopintokokonaisuuden suorittaminen.Jos opiskelija ei ole suorittanut BH40A0301 Energianmuuntoprosesseja, on se valittava tähän sivuopintokokonaisuuteen.
BH20A0451: Heat Transfer, 4 cr
BH30A0201: Nuclear Reactor Design, 6 cr
BH30A0302: Nuclear Power Plant Engineering, 6 cr
BH30A0600: Radiation Protection, 3 cr
BH30A0701: Reliability Engineering, 4 cr
BH40A0301: Applied Thermodynamics, 3 cr
BH40A0801: Turbomachinery, 4 cr
BH40A1600: Turbomachinery in Renewable Energy, 5 cr
BH50A0300: Power Plant Engineering, 6 cr
BH50A0601: Gas Technology, 4 cr
BH50A1300: Maintenance Management, 4 cr
BH50A1701: District Heating, 4 cr
BH50A1800: Fundamentals of Energy Systems Planning, 6 cr
BH50A1900: Planning of Energy Systems, 4 cr
BH50A2200: Bioenergy and Energy Use in the Forest Industry, 6 cr
KaSOIbm: International Business and Management, 21 - 35 cr
Elective courses 21-24 cr
A370A0401: Case-Course of Business, 6 cr
A380A0000: Cross-Cultural Issues in International Business, 6 cr
A380A0131: Business Relationships in International Value Networks, 6 cr
A380A0201: Sales and Marketing Communication, 6 cr
A380A6050: Introduction to International Business and Planning, 3 cr
CS10A0262: International Business Essentials, 6 cr
SaDREE: Renewable Energy and Energy Efficiency, 20 cr
Choose a min. of 20 ECTS cr. BL10A8400SS is a LUT Summer School course.
BL10A8400SS: Solar Economy and Smart Grids, 3 cr
BL20A1300: Energy Resources, 6 cr
BL20A1400: Renewable Energy Technology, 6 cr
BL20A1500: Energy Scenarios, 6 cr
BL40A2301: Energy Efficiency, 6 cr
BH61A0600: Bioenergy, 3 cr

Course descriptions

Descriptions of courses and study modules included in the degree structures

YmDCore: Core Studies, 20 - 40 cr

Validity: 01.08.2016 -
Form of study: Basic studies
Type: Study module
Unit: LUT School of Energy Systems

Grading: Study modules 0-5,P/F

No course descriptions.

Obligatory Studies 31-41 ECTS cr

BH60A2101: Advanced Course in Life Cycle Assessment, 7 cr

Validity: 01.08.2010 -
Form of study: Basic studies
Type: Course
Unit: LUT School of Energy Systems
Grading: Study modules 0-5,P/F
Teachers: Ivan Deviatkin, Risto Soukka, Sanni Väisänen

Note:

Suitable also for doctoral studies.
In order to take the course, the student should have own laptor computer with Windows

Year:

M.Sc. (Tech.) 1

Period:

3-4

Teaching Language:

Finnish and English

Teacher(s) in Charge:

Professor, D.Sc. (Tech.) Risto Soukka

Aims:

Upon completion of the course the student is expected to be able to
1. explain the basic life cycle concepts,
2. plan, implement and analyse assessments to select products and services which fulfil the requirements of sustainable development,
3. plan, implement and analyse assessments to reveal development needs of products and services,
4. recognise the most inexpensive ways to reduce the environmental impact, and
5. perform life cycle assessments using software
6. apply theories to find and develop the most sustainable product, process or system design.

Contents:

Introduction to life cycle assessment, carrying out life cycle assessment, aspects related to inventory analysis, aspects related to impact assessment, calculating a carbon footprint, introduction to life cycle costing, aspects related to life cycle costing, LCA and LCC examples. This course is also suitable for postgraduate students.

Teaching Methods:

3rd period: 10 h of lectures, 3 h of computer training. Assignment 1 with a Quiz, literature and computational part, individual and pair work (approx. 38 h).
4th period: 4 h of lectures, 4 h of computer training. Assignment 2 with Life cycle modelling task, final report and result presentation meeting, group work (approx. 82 h).
Examination and preparation for it (approx. 41 h). Total workload 182 h.

Suitability for doctoral studies (Yes/Leave empty):

Yes

Doctoral School course where enrollment is in WebOodi (Yes/Leave empty):

Yes

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

Yes

Assessment:

0 - 5. Assignments 75 %, examination 25 %.

Course Materials:

Walter Klöpffer, Birgit Grahl Life Cycle Assessment (LCA), A Guide to Best Practice. Moodle. Standards ISO 14040 and ISO 14044.

Prerequisites:

Recommended: BH60A2401 Energy Recovery from Solid Waste and BH60A0252 Solid Waste Management Technology and BH60A1600 Basic Course on Environmental Management and Economics.

Places for exchange-students? (Yes, number/No):

max 10

Places for Open University Students?(Yes, number/No):

max 5

BH60A2701: Energy Efficient Environment, 6 cr

Validity: 01.08.2016 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Energy Systems

Grading: Study modules 0-5,P/F

Teachers: Mika Luoranen, Risto Soukka

Year:

M.Sc. (Tech.) 2

Period:

3-4

Teaching Language:

English

Teacher(s) in Charge:

Mika Luoranen, D.Sc. (Tech.), Associate professor

Aims:

Upon completion of the course the student is expected to be able to:
1. assess the energy related factors that affect areal planning,
2. compare the factors that affect the sustainability of energy solutions for individual buildings and areas, and
3. plan and execute a procedure for comparing relevant energy aspects of competing energy supply alternatives for a housing area.

Contents:

The lectures deal with the following topic areas: regional energy planning; legal and economic control factors; low energy buildings, regional energy supply and environmental performance criteria. Students will complete an assignment in which they assess energy supply alternatives for a given region, including life cycle perspective.

Teaching Methods:

3rd period: 7 x 2 h of lectures
3rd - 4th period: Independent work: individual assignment (approx. 102 h).
Examination and preparation for it (approx. 40 h). Total workload 156 h.

Examination in Examination schedule (Yes/No):

Yes

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

0 - 5. Examination 50 %, assignment 50 %.

Course Materials:

Lecture material, Moodle.

Prerequisites:

Recommended: BH60A2101 Advanced Course in Life Cycle Assessment attended.

Places for exchange-students? (Yes, number/No):

max 5

Places for Open University Students?(Yes, number/No):

max 5

BH60A5700: Business and Sustainability, 6 cr

Validity: 01.01.2018 -
Form of study: Basic studies
Type: Course
Unit: LUT School of Energy Systems
Grading: Study modules 0-5,P/F

Note:

Replaces the course BH60A3001 Corporate Responsibility and Management 2.

Year:

M.Sc. (Tech.) 1

Period:

3-4

Teaching Language:

English

Teacher(s) in Charge:

Professor, D.Sc. (Econ. & Bus. Adm.), M.Sc. (Tech.) Lassi Linnanen
Associate Professor, D.Sc. (Agr. & For.) Mirja Mikkilä

Aims:

Upon the completion of the course the student is expected to be able to:
1. analyze decision making situations related to sustainable business,
2. propose solutions to challenging business situation within sustainable business,

3. understand various sustainable business and enterprise models,
4. evaluate critically responsible corporate communication,
5. discuss and argument on various perspectives of sustainable business based on the learned issues and on-going societal debate.
6. carry out self- and peer evaluations

Contents:

Familiarization with the sustainable business models and the strategic responsibility framework of a firm. Reorganization of dimensions of responsible business. Deepening the application skills of mechanisms and tools of sustainable management. Analysisof business and financial consequences of responsibility governance. Familiarization of basics of business ethics. Communication and reporting ofgoals and implementation of corporate responsibility to stakeholders. Learning of corporate responsibility reporting guidelines.

Teaching Methods:

Lectures 6 h, 3 period. Written report on Corporate Responsibility communication and preparation of seminar presentation, groupwork approximately 30 h, written report 3 period.
Seminar presentation 4. period. Case-assignments, group work, approximately 120 h, 3-4 period. The student mustparticipate in the case-assignments.
Total workload 156 h, of which independent work approximately 118 h.

Suitability for doctoral studies (Yes/Leave empty):

Yes

Doctoral School course where enrollment is in WebOodi (Yes/Leave empty):

Yes

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

Evaluation 0 - 5. Written report 30 %, case-assignments 70 %.

Course Materials:

Caset: Hamschmidt, Jost (toim.): Case studies in sustainability management and strategy: the Oikos collection, 2007,
Pirson, Michael (toim.): Case studies in social entrepreneurship: the Oikos collection, 2015,
GRI yhteiskuntavastuun raportointiohjeisto, versiot 3.1 ja 4. Further course material will beannounced during the lectures,
Course material in Moodle

Prerequisites:

Sustainability transition and sustainable business (Kestävyysmuutos ja johtaminen) or Introduction to Sustainable Business
passed or equivalent knowledge studied earlier.

Places for exchange-students? (Yes, number/No):

Max 5

Places for Open University Students?(Yes, number/No):

Max 5

BH60A5800: Sustainable System Transition, 6 cr

Validity: 01.01.2018 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Energy Systems

Grading: Study modules 0-5,P/F

Note:

Will be organised first time in academic year 2019-2020 in Lahti.
Replaces the course BH60A3501 Sustainable Innovation and System Transition.

Year:

M.Sc. (Tech.) 2

Period:

1-3

Teaching Language:

English

Teacher(s) in Charge:

Professor, D.Sc. (Econ. & Bus. Adm.), M.Sc. (Tech.) Lassi Linnanen
Associate Professor, D.Sc. (Agr.& For.) Mirja Mikkilä

Aims:

1. Upon completion of the course the student is expected to be able to:
    1. understand and analyze complex sustainability challenges,
    2. discuss the central concepts related to system transitions,
    3. develop solutions that fill all aspects of sustainability,
    4. learn to apply theoretical concepts to empirical cases,
    5. work in a multicultural group,
    6. produce a scientific written report and to present findings at a seminar.

Contents:

After completing the course the student is capable to understand and analyze complex sustainability challenges, and apply learned theoretical concepts in solution seeking. The central concepts related to system transitions are discussed in multicultural groups. Solutions for sustainability transition developed during the course are reported and presented orally in the seminar.

Teaching Methods:

9x2h lectures and 5x2h tutorials (28h); 3+6h mid-term and seminar (9h); independent work 120h. Total workload 157.
Independent work consists of group project work (70%), including seminar and mid-term presentation, and peer-evaluation. Individual learning (30%) is assessed on the basis of response papers.

Suitability for doctoral studies (Yes/Leave empty):

Yes

Doctoral School course where enrollment is in WebOodi (Yes/Leave empty):

Yes

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

Evaluation 0 - 5. Project work and seminars 70 %, response papers 30 %.

Course Materials:

Course material will be announced during the lectures. Moodle.

Prerequisites:

Sustainability transition and sustainable business (Kestävyysmuutos ja johtaminen) or Introduction to Sustainable System Transition passed or equivalent knowledge studied earlier.

Places for exchange-students? (Yes, number/No):

max 5

Places for Open University Students?(Yes, number/No):

max 5

BL20A1400: Renewable Energy Technology, 6 cr

Validity: 01.08.2015 -
Form of study: Basic studies
Type: Course
Unit: LUT School of Energy Systems
Grading: Study modules 0-5,P/F
Teachers: Michael Child, Christian Breyer

Year:

M.Sc. (Tech.) 1

Period:

3-4

Teaching Language:

English

Teacher(s) in Charge:

Professor, D.Sc. (Tech.) Christian Breyer

Aims:

Upon completion of the course the student will be able to: 1. Identify the major renewable energy (RE) conversion technologies, mainly converting resources to electricity. 2. Describe the major characteristics of the technologies, in particular applications, efficiency, economics, industrial scale and future prospects. 3. Analyse the need for storage technologies and their different fields of application based on their key technical and economic features.

Contents:

The course is focused on the conversion of the resources to electricity. The RE technologies discussed in the course are: wind turbines, solar photovoltaics, solar thermal electricity generation and hydro powerplants. The storage technologies covered comprise a general overview and in particular include battery storage, pumped hydro storage and power-to-gas technologies. All technologies are classified with respect to their applications, efficiency, maturity, economics, industrial scaling and expected relevance for the ongoing energy transformation.

Teaching Methods:

3rd period lectures 14 h, exercises 14 h. 4thperiod lectures 14 h, exercises 14 h, examination 3 h.
Independent study 97 h.
Total workload 156 h.

Suitability for doctoral studies (Yes/Leave empty):

Yes

Examination in Examination schedule (Yes/No):

Yes

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

0-5, examination 100 %

Course Materials:

Material handed out in class and made available on Moodle.

Places for exchange-students? (Yes, number/No):

15–

Places for Open University Students?(Yes, number/No):

max 5

Students, who haven´t done Johdatus ympäristötekniikan opiskeluun, are required to do Introduction to M.Sc. Studies

BH60A4600: Introduction to M.Sc. Studies, 1 cr

Validity: 01.08.2013 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Energy Systems

Grading: Study modules 0-5,P/F

Teachers: Marjaana Lehtinen, Aki-Pekka Grönman, Sanni Väisänen, Risto Soukka, Katja Hynynen

Note:

Lectures together withall students of International Master's programs in Energy Technology, Electrical Engineering, Mechanical Engineering and Sustainability Science and Solutions.
Lectures for students of MSc programme in Circular Economy will be arranged in Lahti or online (announced in the beginning of the course).

Year:

M.Sc. (Tech.) 1

Period:

1-2

Teaching Language:

English

Teacher(s) in Charge:

Post-Doctoral Researcher, TkT Sanni Väisänen
Post-Doctoral Researcher, TkT Katja Hynynen
Associate Professor, TkT Ahti Jaatinen-Värri
University Lecturer, TkT Kimmo Kerkkänen

Aims:

Upon completionof the course the student is expected to be able to:
1. describe the content of the Degree Programme, interpret the study guide andalso describe the research areas of School of Energy Systems,
2. prepare his/her individual study plan (ePSP) and follow the progress ofhis/her studies with the help of WebOodi's personal study plan,
3. observe the university's examination practices and degree programmepractices (incl. instructions of the Master's Thesis),
4. use the services of the library, retrieve information independently and usethe information sources in accordance with good practices, and also toobserve the copyrights,

5. understand how to manage the studies and how to find help when needed duringhis/her studies,
6. use the Moodle learning environment,
7. knowshow to improve information security during his/her daily use ofuniversity networks,
8. understandthe concept of career planning and use the services of career services,
9. understand the concept of cultural differences and how it mighteffect on his/her daily social intercourse.

Contents:

Getting to know the School of EnergySystems and the Master's programs Studies (incl. Master's Thesis). Studyand exam culture in LUT. LUT library collections, databases,reference practices, and copyrights, information security, career planningand cultural difference related issues. Study Skills and Motivation. ePSPworkshop. Research areas of School of Energy Systems. The course is related to sustainability.

Teaching Methods:

1st and 2nd period: 15 hof obligatory lectures (incl. participation in an ePSP workshop. 1stperiod: Information security training and Information searchning web courses (2+ 5 h). 2nd period: Individual discussion with a teacher tutor 1 h. Individualwork 3 h. Total workload 26 h.

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

Pass/fail. Passing the course requires attendance at the lectures, ePSP, passing individual Information security training and Information searching web courses, written assignment, and discussion with teacher tutor.

Course Materials:

Study Guide, Moodle, LUT library collections, and databases.

Places for exchange-students? (Yes, number/No):

No

Places for Open University Students?(Yes, number/No):

No

Students, who haven´t done BH60A5600 Kestävyysmuutos ja johtaminen, are required to take courses BH60A5200 Introduction to Business and Sustainability and BH60A5300 Introduction to Sustainable System Transition.

BH60A5200: Introduction to Business and Sustainability, 3 cr

Validity: 01.01.2018 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Energy Systems

Grading: Study modules 0-5,P/F

Note:

The course is intended for international students of MSc programmes in Sustainability Science and Solutions and Circular Economy, or Sustainability minor students. Literature examination in the electric exam system. Registration for the course in WebOodi during the academic year. Registration for the

exam using the electric exam software (EXAM). The examination can be carried also during the vacations. Beyond the academic year the registration only for the electric exam software. Moodle is used as a communication platform.

Year:

B.Sc. (Tech.) 3

Period:

1-4

Teaching Language:

English

Teacher(s) in Charge:

Professor, D.Sc. (Econ. & Bus. Adm.), M.Sc. (Tech.) Lassi Linnanen
Associate Professor, D.Sc. (Agr. & For.) Mirja Mikkilä

Aims:

Upon completion of the course the student is expected to be able to:
1. recognize the relationship between the company and society,
2. explain the connection between corporate responsibility and business strategies,
3. recognize organizational, economic, and social issues related to corporate social responsibility,
4. identify tools and mechanism sof corporate responsibility,
5. name dimensions and stakeholders related to corporate responsibility,
6. explain the importance of stakeholders in his/her ownwords.

Contents:

Corporate environmental strategies and application of the methods of environmental management. Identifying the sectors of responsible business operations. Basics of corporate ethics. Informing of and reporting on corporate responsibility issues to the stakeholders. Reporting of corporate social responsibility. Thecourse is related to sustainability.

Teaching Methods:

Literature examination in the exam aquarium. All the exams done during one calendar month are to be reviewed by the 15th of the following month except for the period 1 June – 31 July when the examination swill be evaluated by 15 August. Total workload 78h. See Moodle for further instructions and contact information. Electronic EXAM.

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

Yes

Assessment:

Evaluation 0 - 5. Examination 100 %.

Course Materials:

Chandler,David: Strategic Corporate Social Responsibility: Sustainable Value Creation,2017. Other material and literature specified in MOODLE course overview.

Places for exchange-students? (Yes, number/No):

15–

Places for Open University Students?(Yes, number/No):

15–

BH60A5300: Introduction to Sustainable System Transition, 3 cr

Validity: 01.01.2018 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Energy Systems

Grading: Study modules 0-5,P/F

Note:

The course is intended for international students of MSc programmes in Sustainability Science and Solutions and Circular Economy, or Sustainability minor students. Literature examination in the electric exam system. Registration for the course in WebOodi during the academic year. Registration for the exam using the electric exam software (Exam). The examination can be carried also during the vacations. Beyond the academic year the registration only for the electric exam software. Moodle is used as a communication platform.

Year:

B.Sc. (Tech.) 3

Period:

1-4

Teaching Language:

English

Teacher(s) in Charge:

Professor, D.Sc. (Econ. & Bus. Adm.), M.Sc. (Tech.) Lassi Linnanen
Associate Professor, D.Sc. (Agr. & For.) Mirja Mikkilä

Aims:

Uponcompletion of the course the student is expected to be able to:
1. recognize the dimenions of sustainable transition,
2. explain the connection sustainabletransition and sustainable business strategies,
3. recognize organizational,economic, and social issues related to sustainable transition,
4. identify tools and mechanisms of sustainability governance,
5. name dimensions and agents related to sustainable transition.

Contents:

Upon completion of the course student is expected to be able to name and recognize connections between global environmental change and sustainability, to understand and explain the basic ideas of systems thinking and how it has changed environmental management approach, and to describe themain premises of socio-technical transitions.

Teaching Methods:

Literature examination in the exam aquarium. All the examsdone during one calendar month are to be reviewed by the 15th of thefollowing month except for the period 1 June – 31 July when the examinations will be evaluated by 15 August. Total workload 78h. See Moodle for further instructions and contact information. Electronic Exam.

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

Yes

Assessment:

Evaluation 0 - 5. Examination 100 %.

Course Materials:

The applicable parts of the followingtextbooks, the examination material specified in Moodle course overview:

Boelie Elzen, Frank W. Geels, Kenneth Green (Editors): System Innovation and the Transition to Sustainability: Theory, Evidence and Policy.2004.
Labanca (Ed.). Complex systems and socialpractices in energy transitions. 2017
Other material and literature specified in Moodle course overview.
Tukker et al. (Eds.). System innovation forsustainability 1: Perspectives on radical changes to sustainable consumptionand production. 2008.

Places for exchange-students? (Yes, number/No):

15–

Places for Open University Students?(Yes, number/No):

15–

Students, who haven´t done Ympäristötekniikan perusteet, are required to do BH60A4400 Introduction to Sustainability.

BH60A4400: Introduction to Sustainability, 3 cr

Validity: 01.08.2013 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Energy Systems

Grading: Study modules 0-5,P/F

Teachers: Risto Soukka, Virgilio Panapanaan, Mirja Mikkilä

Year:

M.Sc. (Tech.) 1

Period:

1

Teaching Language:

English

Teacher(s) in Charge:

Professor, D.Sc. (Tech.) Risto Soukka

Aims:

Upon completion of the course the students are expected to be able to:
1) explain the interaction between the environment, society and business and understand the relationships of various actors in these fields and their impacts on the society and the environment,
2) understand the core idea and thinking behind sustainability and its importance in order to limit or decelerate environmental damages and improve our quality of life while pursuing a more sustainable lifestyle and business within the planetary boundaries,
3) understand and apply practically the learned principles and concepts of sustainability in relation to current production and consumption habits,
4) know and be guided about the different value-adding activities and tools that promote sustainability

Contents:

The idea is to learn and understand sustainability challenges and their interconnectedness, and find out how we could move or transit towards a more sustainable world.

Teaching Methods:

1st period: 14 h of lectures. Independent study (approx. 64 h): assignment (group work) and seminar (approx. 26 h). Preparation for the examination and the exam (approx. 38 h). Total workload 78 h.

Suitability for doctoral studies (Yes/Leave empty):

Yes

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

Yes

Examination in Exam (Yes/No):

No

Assessment:

0 - 5. Examination 60 %, assignment 40 %.

Course Materials:

Will be announced during lectures. Moodle.

Places for exchange-students? (Yes, number/No):

max 5

Places for Open University Students?(Yes, number/No):

max 5

YmDSusta: Sustainability Science and Solutions, 40 - 70 cr

Validity: 01.08.2016 -
Form of study: Major studies
Type: Study module
Unit: LUT School of Energy Systems
Grading: Study modules 0-5,P/F

No course descriptions.

Obligatory Studies 56 ECTS cr

BH60A5000: Master's Thesis, 30 cr

Validity: 01.08.2015 -
Form of study: Basic studies
Type: Master's Thesis
Unit: LUT School of Energy Systems
Teachers: Risto Soukka

Year:

M.Sc. (Tech.) 2

Period:

1-4

Teaching Language:

English

Teacher(s) in Charge:

Professor, D.Sc. (Tech.) Risto Soukka

Aims:

Upon completion of the course the student is expected to be able to:
1. define a research problem,
2. choose and apply research methods relevant to the research problem,
3. search for suitable reference material, and assess the quality and reliability of the material and the information it contains,

4. use and interpret reference material correctly and diversely,
5. report on his or her work in writing, taking into account language and layout requirements, and
6. give a concise oral presentation on the content and results of the work.

Contents:

The thesis is a research or a planning project. Students must demonstrate the ability to complete the project independently and following a plan. A report is prepared following the instructions for the Master',s thesis.

Teaching Methods:

The presentation of the thesis will be arranged with the supervising professor. There will not be a separate seminar. Total workload approx. 780 h.

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

0 - 5. Master',s Thesis 100 %.

Course Materials:

-

Places for exchange-students? (Yes, number/No):

No

Places for Open University Students?(Yes, number/No):

No

BH60A0252: Solid Waste Management Technology, 7 cr

Validity: 01.08.2016 -
Form of study: Basic studies
Type: Course
Unit: LUT School of Energy Systems
Grading: Study modules 0-5,P/F
Teachers: Jouni Havukainen, Mika Luoranen, Mika Horttanainen

Year:

M.Sc. (Tech.) 1

Period:

1-2

Teaching Language:

English

Teacher(s) in Charge:

Professor, D.Sc. (Tech.) Mika Horttanainen

Aims:

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.

Contents:

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.

Teaching Methods:

1st period: 14 h of lectures, 10 h of tutorials. 2nd period: 12 h of lectures, 8 h of tutorials. Assignment with literature and calculation part, presentation, individual work approx. 82 h. Field trip approx. 12 h. Lecture assignments approx. 10 h. Examination and preparation for it approx. 30 h. Total workload 182 h.

Examination in Examination schedule (Yes/No):

Yes

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

0 - 5. Examination 50 %, assignment 40 %, lecture assignments 10 %.

Course Materials:

Tchobanoglous, Theisen, Vigil: Integrated Solid Waste Management, 1993. Handouts provided by the lecturer, course environment on Moodle.

Prerequisites:

BH60A0001 Ympäristötekniikan perusteet, BH60A0901 Ympäristömittaukset or equivalent knowledge

Places for exchange-students? (Yes, number/No):

max 15

Places for Open University Students?(Yes, number/No):

max 10

BH60A0451: Air Pollution Control, 6 cr

Validity: 01.08.2016 -
Form of study: Basic studies
Type: Course
Unit: LUT School of Energy Systems
Grading: Study modules 0-5,P/F
Teachers: Risto Soukka, Ville Uusitalo

Year:

M.Sc. (Tech.) 1-2

Period:

1-2

Teaching Language:

English

Teacher(s) in Charge:

Professor, D.Sc. (Tech.) Risto Soukka

Aims:

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

Contents:

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

Teaching Methods:

14 h of lectures, 1st - 2nd period. 20 h of lectures, 1st - 2nd period. Option for study trip 8 h. Independent work (approx. 114 h): Assignment, approx. 60 h, Examination and preparation for it, approx. 54 h. Total workload 156 h.

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

Yes

Assessment:

0 - 5. Examination 50 %, assignment 50 %.

Course Materials:

De Nevers Noel: Air Pollution Control Engineering, Cooper: Air Pollution Control - A Design Approach. Moodle.

Places for exchange-students? (Yes, number/No):

max 5

Places for Open University Students?(Yes, number/No):

max 5

BH60A0652: Sustainable Water Use, 6 cr

Validity: 01.08.2016 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Energy Systems

Grading: Study modules 0-5,P/F

Teachers: Heli Kasurinen, Risto Soukka

Year:

M.Sc. (Tech.) 2

Period:

1-2

Teaching Language:

English

Teacher(s) in Charge:

Professor, D.Sc. (Tech.) Risto Soukka

Aims:

Upon completion of the course the student is expected to be able to
1. define the key concepts of water pollution control,
2. explain the operation of essential process technology and equipment related to the control of water pollution,
3. compare and give grounded proposals for treatment methods and processes applicable to different situations,
4. apply legislation and official regulations related to water pollution control and sludge treatment,
5. apply means to protect groundwater,
6. apply means to reduce the environmental load of surface waters,
7. describe the key factors that can affect the water footprint,
8. describe the measures for the environmentally friendly management of by-product flows, and
9. compare the economic efficiency of different wastewater treatment methods.

Contents:

Sustainability challenges of water use. Water supply, water use in different sectors and loading of water systems. Wastewater treatment in industry and municipalities. Sludge treatment. Production of drinking water. Protection of groundwater deposits.

Teaching Methods:

1st - 2nd period: 14 h of lectures. 1st - 2nd period: tutorials and independent exercises 20 h. 1st - 2nd period: Assignment approx. 60 h. 1st or 2nd period: Field trip approx. 8 h. Examination and preparation for it approx. 54 h. Total workload 156 h.

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

Yes

Examination in Exam (Yes/No):

Yes

Assessment:

0 - 5. Examination 50 %, assignment 50 %.

Course Materials:

Tchobanoglous: Wastewater Engineering. Treatment and Reuse, 2003. Handouts provided by the lecturer, course environment on Moodle.

Prerequisites:

BH60A0001 Ympäristötekniikan perusteet or equivalent knowledge.

Places for exchange-students? (Yes, number/No):

No

Places for Open University Students?(Yes, number/No):

max 5

BH60A1201: Indoor Climate Management of Buildings, 7 cr

Validity: 01.08.2016 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Energy Systems

Grading: Study modules 0-5,P/F

Teachers: Mika Luoranen, Mihail Vinokurov, Jarkko Mäki

Year:

M.Sc. (Tech.) 1

Period:

1-2

Teaching Language:

English

Teacher(s) in Charge:

Mika Luoranen, D.Sc. (Tech.), Associate professor

Aims:

Upon completion of the course the student is expected to be able to:
1. identify and assess the factors that affect the design of ventilation systems,
2. assess systems that meet the ventilation requirements of different facilities and choose the applicable ventilation system,
3. assess energy efficiency of a ventilation/air conditioning system,
4. recognize and apply special regulations in the field,
5. design a ventilation system for a public facility with a professional software,
6. apply one’s learnings to practical design work.

Contents:

Ventilation demand in different facilities. Ventilation systems for buildings. Air distribution and air flows in rooms. Air treatment processes: mixing, heating, cooling, humidifying, filtration. Energy economics of ventilation. Heat recovery systems. Control of air conditioning systems. Design of air conditioning systems.

Teaching Methods:

1st period: 14 h of lectures, 7 h of calculation tutorials, 14 h of CAD tutorials, 1 h introduction to laboratory work.
2nd period: 14 h of CAD tutorials, 2 h of laboratory measurements. The assignment consists of a literature, a calculation and a CAD part. The assignment will be completed individually. Independent work, approximately 130 h: Assignment (mostly carried out in connection with the CAD tutorials). Laboratory assignment. Examination and preparation for it. Total workload 182 h.

Examination in Examination schedule (Yes/No):

Yes

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

0 - 5. Examination 30 %, assignment 40 %, laboratory assignment 30 %.

Course Materials:

Study materials: Course material in Moodle.

Prerequisites:

BH20A0750 Engineering Thermodynamics attended.

Places for exchange-students? (Yes, number/No):

Max 5

Places for Open University Students?(Yes, number/No):

max 5

YMSSSVal: Free elective studies, 0 - 100 cr

Validity: 01.08.2018 -
Form of study: Elective studies
Type: Study module
Unit: LUT School of Energy Systems
Grading: Study modules 0-5,P/F

No course descriptions.

Choose enough free elective studies to attain 120 ECTS cr

A350A0500: Sustainable Strategy and Business Ethics, 3 cr

Validity: 01.08.2013 -
Form of study: Basic studies
Type: Course
Unit: LUT School of Business and Management
Grading: Study modules 0-5,P/F
Teachers: Karl-Erik Michelsen, Paavo Ritala, Laura Olkkonen

Note:

Only Master-level students, i.e those that have completed a Bachelor's degree or equivalent before the beginning of the course, are allowed to enroll.

Year:

M.Sc. (Econ. & Bus. Adm.) 1

Period:

2

Teaching Language:

English

Teacher(s) in Charge:

Professor, D.Sc. Paavo Ritala
Professor, Ph.D. Karl-Erik Michelsen
Post-doctoral Researcher, Ph.D. Laura Olkkonen

Aims:

This course concentrates on the topical phenomena and concepts related to the creation and development of sustainable strategy, shared value creation and business ethics in organisations. The concepts will be investigated both from the viewpoints of academic research and practical relevance. Students will learn to discuss and synthesize the recent literature, examine the links of contemporary topics to previous research and assess the practical relevance of the issues through concrete examples. The learning outcomes of the course are the following:
1.To assess the topics of sustainable strategy and business ethics in the firm level as well as within the broader institutional context from both academic and practitioner perspectives.
2.To discuss and debate on the conflicting perspectives of sustainability and ethics in business.
3. To be able to analyze the practical relevance of sustainable business strategy

Contents:

The content of the course is based on topical issues related to sustainable strategy and business ethics from different approaches.
The core content includes: - Basics of sustainability and ethics in business context - Recent trends and developments of sustainable strategy and corporate responsibility - Sustainability issues in the supply network - Key business ethics challenges

Teaching Methods:

In-class hours: 2. period: 12 hours of lectures, 6 hours of interactive theme sessions and seminars, and an interactive panel session with business and societal experts (4 hours).
Out-class hours: Preparation for the theme sessions and seminars: 8 h. Course assignment in groups 50 h. Total hours: 80 h.

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

No written exam. Final grade 0-5. 100 points based on course assignment conducted in groups.

Course Materials:

Academic and practitioner-oriented articles on sustainability and business ethics. Readings list distributed in Moodle.

Prerequisites:

Only Master-level students, i.e. those that have completed a Bachelor's degree or equivalent before the beginning of the course, are allowed to enroll.

Places for exchange-students? (Yes, number/No):

max 10

Places for Open University Students?(Yes, number/No):

max 5

BH50A0400: Water Treatment, 2 cr

Validity: 01.08.2007 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Energy Systems

Grading: Study modules 0-5,P/F

Teachers: Kari Luostarinen, Esa Vakkilainen

Note:

Course registaration by e-mail to the assistant.
Self-study and an examination in Moodle.

Year:

M.Sc. (Tech.) 1

Period:

1-4

Teaching Language:

Finnish

Teacher(s) in Charge:

Professor, D.Sc. (Tech.) Esa Vakkilainen, Research assistant, M.Sc. (Tech.) Kari Luostarinen

Aims:

Upon completion of the course the students will be able to 1. describe the production methods of the water used in power plants, 2. define the fundamental chemistry of water treatment, 3. describe the water quality measurement methods, 4. recognise the damages and danger situations caused by the water impurities, and 5. apply the information on water treatment processes essential for energy production.

Contents:

The fundamentals of water treatment in brief. Water analytics. The production of process water and especially of makeup water for power plants. The influence of impurities on the water-steam cycle. Preservation of power plants.

Teaching Methods:

100 % online course in Moodle. Self-study: Preparation for the examination 8 h and the examination in Moodle 3 h. Material study 41 h.
Total workload 52 h.

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

Yes

Examination in Exam (Yes/No):

No

Assessment:

0 - 5. Examination in Moodle 100 %.

Course Materials:

Buecker, Brad, Fundamentals of steam generation chemistry, PennWell, 2000.
Material in Moodle.

Places for exchange-students? (Yes, number/No):

No

Places for Open University Students?(Yes, number/No):

max 10

BH60A0150: Project work 1, 2 - 10 cr

Validity: 01.08.2014 -
Form of study: Basic studies
Type: Course
Unit: LUT School of Energy Systems
Grading: Study modules 0-5,P/F
Teachers: Maija Leino, Risto Soukka

Note:

The course starts at the intensive week 43.

Year:

B.Sc. (Tech.) 2

Period:

2-4

Teaching Language:

Finnish

Teacher(s) in Charge:

Professor, D.Sc. (Tech.) Risto Soukka

Aims:

Upon completion of the course the student will be able to act as an active member of an interdisciplinary project team in different roles. Depending on her/his role in the project, the student can:
1. describe the outline of the project plan and apply different methods to divide the project into subtasks and to schedule the project,
2. prepare a budget for the project and monitor it,
3. document the group's and her/his project work results both orally and in writing,
4. reflect her/his actions as a member of the team and assess the outcome of the project and the other team members' work,
5. recognise the key elements in project risk management,
6. apply knowledge and skills acquired in other courses to complete the project.

Contents:

Varying themes according to the project.

Teaching Methods:

Project management lectures in intensive week 43. Working in a project as a member of a project team in different roles and tasks e.g. related to generating ideas, planning, dimensioning, construction, manufacturing, measuring and testing, documentation, management and negotiations. Continuous self-assessment, evaluation of the project group work and the outcome of the project e.g. with a learning and /or project diary.

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

1-5. The course is evaluated based on the work done in the project and its appropriate documentation, by student self-assessment and by teachers and peers. The number of credits obtained depends on the scope of work done in the project, and therefore, comprehensive documentation, monitoring and reporting on the project are key elements in the evaluation. The number of credits might be defined already before the start of the project.

Course Materials:

Case-specific.

Places for exchange-students? (Yes, number/No):

No

Places for Open University Students?(Yes, number/No):

No

BH60A2401: Energy Recovery from Solid Waste, 4 cr

Validity: 01.08.2010 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Energy Systems

Grading: Study modules 0-5,P/F

Teachers: Mika Horttanainen, Mika Luoranen

Year:

M.Sc. (Tech.) 2

Period:

1-2

Teaching Language:

English

Teacher(s) in Charge:

Professor, D.Sc. (Tech.) Mika Horttanainen

Aims:

Upon completion of the course the student is expected to be able to
1. describe the properties of waste as fuel,
2. explain the most common waste-to-energy technologies and their suitability for different energy recovery applications and materials,
3. determine the waste-to-energy recovery potential of a region,
4. describe the most important flue gas emissions and their reduction technologies characteristic for the combustion of waste, and
5. analyse the role of energy recovery in municipal waste management.

Contents:

Waste-to-energy in Finland and other countries, properties of waste as a fuel, waste handling before thermal conversion, preparation of recycled fuel, mass combustion of waste, combustion of recycled fuel, gasification of waste, energy recovery in combustion of waste, emission reduction during combustion, flue gas treatment, utilisation and treatment of ash, energy recovery in anaerobic digestion of waste, landfill gas utilisation in energy production.

Teaching Methods:

1st period: 14 h of lectures, 14 h of exercises.
2nd period: 4 h of lectures, assignment info (2 h). Group assignment including calculations, written group report (approx. 44 h). Excursion (approx. 6 h). Written examination and preparation for it, approx. 20 h. Total workload 106 h.

Examination in Examination schedule (Yes/No):

Yes

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

Yes

Assessment:

0 - 5. Examination 50 %, practical assignment 50 %.

Course Materials:

Course book (to the appropriate extent): Niessen, W., 2002. Combustion and incineration processes. Marcel Dekker, Inc., New York. SBN: 0-8247-0629-3. Moodle.

Prerequisites:

Basic knowledge on thermodynamics, chemistry and power plant technology.

Places for exchange-students? (Yes, number/No):

No

Places for Open University Students?(Yes, number/No):

max 5

BH60A4301: Environmental Technology Project Work, 2 - 7 cr

Validity: 01.08.2016 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Energy Systems

Grading: Study modules 0-5,P/F

Teachers: Lassi Linnanen, Mika Horttanainen, Risto Soukka

Note:

The students register for the course be contactiong the professor (Master',s degree students)/supervisor (exchange students), with an idea of the topic.

Year:

M.Sc. (Tech.) 1-2

Period:

1-4

Teaching Language:

English

Teacher(s) in Charge:

Professor, D.Sc. (Tech.) Risto Soukka, Professor, D.Sc. (Tech.) Mika Horttanainen, Professor, D.Sc. (Econ. & Bus. Adm.), M.Sc. (Tech.) Lassi Linnanen

Aims:

Upon completion of the course the student is expected to be able to:
1. choose appropriate research methods for a research problem in a given field of environmental technology,
2. find and select appropriate reference material for research,
3. independently make the timetable and conduct a compact research project, and
4. prepare a written report on his/her work according to instructions.

Contents:

Producing a research report on a given subject on the basis of a literature review. The subject of the research can also be assigned by an enterprise.

Teaching Methods:

1st-4th periods: Advanced practical or seminar work 50 - 780 h, (=,independent work). The method of completion is agreed on with the supervising professor. No contact teaching.

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

0 - 5. Project work 100 %.

Course Materials:

Case-specific

Prerequisites:

The prerequisites are set individually depending on the case.

Places for exchange-students? (Yes, number/No):

max 5

Places for Open University Students?(Yes, number/No):

max 5

BH60A4400: Introduction to Sustainability, 3 cr

Validity: 01.08.2013 -
Form of study: Basic studies
Type: Course
Unit: LUT School of Energy Systems
Grading: Study modules 0-5,P/F
Teachers: Risto Soukka, Virgilio Panapanaan, Mirja Mikkilä

Year:

M.Sc. (Tech.) 1

Period:

1

Teaching Language:

English

Teacher(s) in Charge:

Professor, D.Sc. (Tech.) Risto Soukka

Aims:

Upon completion of the course the students are expected to be able to:
1) explain the interaction between the environment, society and business and understand the relationships of various actors in these fields and their impacts on the society and the environment,
2) understand the core idea and thinking behind sustainability and its importance in order to limit or decelerate environmental damages and improve our quality of life while pursuing a more sustainable lifestyle and business within the planetary boundaries,
3) understand and apply practically the learned principles and concepts of sustainability in relation to current production and consumption habits,
4) know and be guided about the different value-adding activities and tools that promote sustainability

Contents:

The idea is to learn and understand sustainability challenges and their interconnectedness, and find out how we could move or transit towards a more sustainable world.

Teaching Methods:

1st period: 14 h of lectures. Independent study (approx. 64 h): assignment (group work) and seminar (approx. 26 h). Preparation for the examination and the exam (approx. 38 h). Total workload 78 h.

Suitability for doctoral studies (Yes/Leave empty):

Yes

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

Yes

Examination in Exam (Yes/No):

No

Assessment:

0 - 5. Examination 60 %, assignment 40 %.

Course Materials:

Will be announced during lectures. Moodle.

Places for exchange-students? (Yes, number/No):

max 5

Places for Open University Students?(Yes, number/No):

max 5

BH50A2200: Bioenergy and Energy Use in the Forest Industry, 6 cr

Validity: 01.01.2018 -
Form of study: Basic studies
Type: Course
Unit: LUT School of Energy Systems
Grading: Study modules 0-5,P/F

Year:

M.Sc. (Tech.) 2

Period:

3-4

Teaching Language:

English

Teacher(s) in Charge:

Professor, D.Sc. (Tech.) Esa Vakkilainen

Aims:

Upon completion of the course the students will be able to recognize the importance of forest industry to economy, can describe processes used, understands the role of biomass, recycling and bioenergy, can evaluate and understand the energy use of basic processes, explain the importance of energy procurement for forest industry mill. Understands the factors that determine effective energy use and production. Can draw the energy procurement plan for a forest industry mill.

Contents:

Principles of producing chemical kraft pulp and process energy use. Importance of bioenergy and biofuels in forest industry. Project planning and execution. Engineering design: Students develop energy procurement plan for given forest industry mill through team and project work. Modelling of the power plant for the planning. Energy use for plant subprocesses. The dimensioning and optimisation of energy delivery. Thermal engineering simulation. Compare factors affecting the power plant economics. Documentation of results.

Teaching Methods:

3rd period: 10 h of lectures and planning tutorials. 4th period: 8 h of planning tutorials. Assignment. Exam. Independent study approximately: Written assignment 80 h. Studying given material 52 h. Exam 3 h.
Total workload 156 h.

Examination in Examination schedule (Yes/No):

Yes

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

0 - 5. Examination 70%, written report of the engineering design assignment 30 %.

Course Materials:

Lecture notes.

Places for exchange-students? (Yes, number/No):

max 5

Places for Open University Students?(Yes, number/No):

max 5

BK50A2701: Selection Criteria of Structural Materials, 5 cr

Validity: 01.08.2016 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Energy Systems

Grading: Study modules 0-5,P/F

Teachers: Harri Eskelinen, Jörg Wunderlich, Sari Pärssinen

Note:

The course is arranged concurrently in face-to-face learning and distance learning environment. Replaces the course BK10A2900 Konstruktiomateriaalit ja niiden valinta JEDI

Year:

M.Sc. (Tech.) 1

Period:

3-4

Teaching Language:

English

Teacher(s) in Charge:

Professor, D.Sc. (Tech.) Harri Eskelinen

Aims:

After having passed this course module the student is able to:
- apply and develop systematic and analytical means and tools of systematic material selection approaches into solving cross-technological material selection tasks
- define and analyse the properties, the strengths, the weaknesses and the application areas of the main groups of constructional materials for different types of applications
- is able to justify and build generalized models to take into a count both the functionality and the manufacturability aspects in addition to the total costs and environmental aspects of the product in solving the material selection task
- is able to evaluate and utilize recent results and documents of material science
- derive analytical models based on the principles of LCC's, LCA's and MIPS-factors in material selection.

Contents:

During the course the student will become familiar with the properties and application areas of different constructional materials. The recent scientific results dealing with material science and technology will be discussed. Aspects of selecting and comparing different materials are discussed from the viewpoints of functionality, manufacturing aspects, costs and environmental aspects of the product. Future trends in materials science are discussed briefly. Metals and their alloys, polymers, ceramics, composites, wood materials, adaptive materials, nanomaterials. Environmental aspects of material selection from the viewpoint of LCC and LCA and the basics of MIPS calculations. Innovative solutions of the material selection tasks will be discussed. Principles to formulate and solve the materials solution tasks based on analytical and systematic approaches and means to develop models to support the selection process staring from the product's requirement list will be discussed in details. Multi-language teaching environment will be utilized during the project work.
Project work focuses to selecting structural materials for industrial applications.

Teaching Methods:

For face-to-face learning (3-4 period): Introduction lecture 2 h, 3rd period. Learning diary 36 h, 3rd-4th period. Exercises in small teams 28 h, 3rd-4th period. Project work and poster presentation 44 h, 3rd-4th period. Independent study 20
h. Total workload 130 h.
For distance learning (non-stop):Project work 60 h, Independent study 68 h, Skype-exam and-meetings 2 h.
The course is suitable for distance learning.

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

For face-to-face learning, 0-5, comprehensive and continuous evaluation 50 %, project work 50 %
For distance learning: 0-5, Skype-exam 50 %, project work 50 %

Course Materials:

Mangohon, P., The Principles of Materials Selection for Engineering Design. Strong, A. B., Plastics, Materials and Processing. Kalpakjan, S. & Schmid, S., Manufacturing Engineering and Technology. Lectures and exercises in Moodle. For Finnish students and distance learning: Eskelinen &
Karsikas, Vihreän teknologian näkökulmat konstruktiomateriaalien valinnassa, ISBN 978-952-265-457-1.

Limitation for students? (Yes, number, priorities/Leave empty):

The possibility to pass the course via distance learning is meant only for students of LUT's distance learning programs.

Places for exchange-students? (Yes, number/No):

No

Places for Open University Students?(Yes, number/No):

No

BL40A2600: Wind power and solar energy technology and business, 5 cr

Validity: 01.08.2013 -
Form of study: Basic studies
Type: Course
Unit: LUT School of Energy Systems
Grading: Study modules 0-5,P/F
Teachers: Katja Hynynen, Olli Pyrhönen

Year:

B.Sc. (Tech.) 3

Period:

3-4

Teaching Language:

Finnish

Teacher(s) in Charge:

D.Sc. (Tech.) Katja Hynynen

Aims:

Upon completion of the course the student will be able to: 1. model the process from wind energy into company turnover at the principle level, 2. identify and describe the key technologies related to wind power, the core business principles, environmental issues,
energy policy and their development trends, 3. describe the mutual effects of wind power and electric power systems, 4. identify and describe the technologies related to solar power., 5. describe the basic principle of photovoltaic cells, 6. estimate the performance and
profitability of a PV plant.

Contents:

Process modelling from kinetic energy of wind into company turnover and from solar radiation to turnover. Basic components of a wind
power plant (turbine, gearbox, generator, power electronics, power electronics, tower), environmental effects of wind power, wind park planning, grid effects of wind power, economic feasibility of wind power under different circumstances, wind conditions in Finland. Solar energy technologies, operating principle of solar panels, PV solar power plant structure.

Teaching Methods:

Lectures 14 h, homework, 3rd period. Lectures 14 h, 4th period. Weekly homework. Two assignments. Total workload 130 h.

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

0-5, project works 60 %, homework 40 %.

Course Materials:

Material handed out in class. Moodle.

Prerequisites:

Basics of physics (mechanics, thermodynamics, electricity)

Places for exchange-students? (Yes, number/No):

No

Places for Open University Students?(Yes, number/No):

max 5

CS30A1691: Social Sustainability, 6 cr

Validity: 01.08.2016 -
Form of study: Basic studies
Type: Course
Unit: LUT School of Business and Management
Grading: Study modules 0-5,P/F
Teachers: Helinä Melkas, Suvi-Jonna Martikainen, Suvi Konsti-Laakso, Rakhshanda Khan, Satu Pekkarinen

Year:

B.Sc. (Tech.) 3

Period:

4

Teaching Language:

English

Teacher(s) in Charge:

Professor, D.Sc. (Tech.) Helinä Melkas
Rakhshanda Khan, PhD, Senior Researcher
Satu Pekkarinen, PhD, Senior Researcher
Suvi Konsti-Laakso, M.Sc., Researcher
Suvi-Jonna Martikainen, MA, Researcher

Aims:

After completion of the course, students will be able to
- explain and analyze the significance and meaning of social sustainability in development of business, organization and product and service processes
- discuss both theoretical and practice-based viewpoints as well as the kinds of tools and methods that enable social sustainability to become part of business, management and product and service development
- determine and compare appropriate situations for applying these methods
- differentiate between elements for critical thinking concerning social sustainability.

Contents:

Core content: social sustainability at different levels (global, societal and organizational), social innovation, frugal innovation, social enterprise, end-user involvement, employee involvement. Supplementary content: practical cases, methods and Living Lab activities.

Teaching Methods:

Lectures (intensive teaching) and small group assignments during the lectures 5 h, case exercise to be given during the lectures 60 h, independent and/or group studies 60 h, presentation of case exercises in a closing seminar 10 h, personal learning diary 21 h = total 156 h.

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

0 - 5. Case exercise 70%, learning diary 30%.

Course Materials:

The study materials consist of course slides and selected articles (will be announced later).

Prerequisites:

None.

Places for exchange-students? (Yes, number/No):

max 15

Places for Open University Students?(Yes, number/No):

max 5

CS31A0610: Life-Cycle Costing of Investment Projects, 6 cr

Validity: 01.08.2016 -
Form of study: Basic studies
Type: Course
Unit: LUT School of Business and Management
Grading: Study modules 0-5,P/F

Teachers: Sini-Kaisu Kinnunen, Timo Kärri

Note:

Can't be included into a same degree as CS31A0603 Life-Cycle Costing of Investment Projects.

Year:

M.Sc. 1-2

Period:

1

Teaching Language:

Finnish

Teacher(s) in Charge:

Professor, D.Sc. (Tech.) Timo Kärri
M.Sc. (Tech.) Sini-Kaisu Kinnunen

Aims:

After completing the course students will be able to:
- prepare and evaluate investment proposals
- analyze requirements of sustainability during the life-cycle of projects.

Contents:

Investment proposal. Life-cycle of investment project, life-cycle costs and profits, capital costs, initial investment and working capital, classification and selection of projects, uncertainty and risks. Evaluation methods introduced: net present value, internal rate of return, return on investment, payback period, benefit-cost ratio and profitability index. Investment process, timing and financing of projects, public-private partnership, life-cycle models of machine replacements, concept of real option, evaluation of projects from the perspective of sustainability.

Teaching Methods:

Lectures 26 h, exercises 10 h, micro-execises 9 h, homeworks 12 h, individual tasks 64 h, preparation for exam and exam 36 h, 1. period. Total 157 h.

Examination in Examination schedule (Yes/No):

Yes

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

0 - 5. Exam, extra points from assignments.

Course Materials:

Lecture notes (2 copies). Mott, Graham: Investment appraisal. Pitman Publishing, 1997, (196 p.). Götze U. et al: Investment appraisal - Methods and models. Springer. 2008, (341 p.)

Prerequisites:

CS31A0102 Kustannusjohtamisen peruskurssi

Places for exchange-students? (Yes, number/No):

No

Places for Open University Students?(Yes, number/No):

max 5

CT10A7004: Sustainability and IT, 6 cr

Validity: 01.08.2018 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Business and Management

Grading: Study modules 0-5,P/F

Teachers: Jari Porras

Note:

This course is meant only for the fulltime students of the software engineering programme.

Year:

M. Sc. 1

Period:

3-4

Teaching Language:

English

Teacher(s) in Charge:

Prof., D.Sc. (Tech.) Jari Porras

Aims:

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

Contents:

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.

Teaching Methods:

This course follows flipped classroom approach. Introductory lectures are used for introducing the lecture material and dividing students into smaller groups.
Lectures 2 h, Mandatory classroom discussions 8 h, Homeworks 16 h, Reading assignments 24h, Period 3.
Lectures 6h, Mandatory classroom discussions 8h, Homeworks 16 h, Reading assignments 24 h, Project work 52 h, Period 4
Total 156 h.

Assessment:

0-5 continuous evaluation (no exam)
Presentation(s) 10%
Discussions 20%
Individual homeworks (x2) 20%
Group based homeworks (x2) 20%
Project 30%

Course Materials:

Murugesan S. & Gangadharan G.R.: Harnessing Green IT - Principles and practices, Wiley, 2012, 433 p
Tomlinson B.: Greening through IT - Information Technology for Environmental Sustainability, MIT Press, 2010, 221 p
A set of yearly changing scientific articles that will be announces at the moodle pages of the course.

Limitation for students? (Yes, number, priorities/Leave empty):

This course is meant only for the full time students of the software engineering programme

Places for exchange-students? (Yes, number/No):
max 10

KIEN0017: Academic Writing, 3 cr

Validity: 01.08.2018 -
Form of study: Language and communication studies
Type: Course
Unit: Language Center
Grading: Study modules 0-5,P/F

No course descriptions.

KIEN0006: English for Professional Development (Technology), 4 cr

Validity: 01.08.2018 -
Form of study: Language and communication studies
Type: Course
Unit: Language Center
Grading: Study modules 0-5,P/F

No course descriptions.

KIEN0015: Effective Presentations, 2 cr

Validity: 01.08.2018 -
Form of study: Language and communication studies
Type: Course
Unit: Language Center
Grading: Study modules 0-5,P/F

No course descriptions.

KIEN0013: Meetings and Discussions, 3 cr

Validity: 01.08.2018 -
Form of study: Language and communication studies
Type: Course
Unit: Language Center
Grading: Study modules 0-5,P/F

No course descriptions.

BH60A3700: Work internship in Master's degree, 2 - 10 cr

Validity: 01.08.2012 -
Form of study: Basic studies
Type: Practical training
Unit: LUT School of Energy Systems

Grading: Study modules 0-5,P/F

Teachers: Lassi Linnanen, Simo Hammo

Year:

M.Sc. (Tech.) 1-2

Period:

1-4

Teaching Language:

Finnish

Teacher(s) in Charge:

Laboratory Engineer, Lic.Sc. (Tech.) Simo Hammo

Aims:

After the work environment internship, the student will have the basic knowledge of work, working environment and working community in his/her own field. The student will be able to apply the knowledge and skills acquired during the course of studies to work in his/her own field.

Contents:

The student obtains a (summer) job from the company, works there as a paid employee, requests for a certificate of employment and applies for the approval of the work as an internship for the Master's degree. Full-time employment relationships of at least four weeks can be approved as internships. The completion of the Master's thesis is not accepted as an internship. An employment relationship preceeding the studies can be approved as an internship, provided that it has not been accepted and included in any other previous degree.

Teaching Methods:

The first 2 ECTS credits: applying for a job and recruiting 10 h, tasks connected to beginning of an employment relationship (e.g. orientation, the rules of the employment relationship and the workplace) 15 h, observing (while working) how the working community operates (e.g. how work/production is organized, supervision, the working manners of the working community/teams, the social environment of the workplace) 22 h, a written internship report 5 h (2 - 3 pages), total workload 52 h. 3 - 10 ECTS credits: having different tasks in a company 26 - 208 h (1 ECTS credit/26 h). The number of ECTS credits of compulsory internship varies depending on the degree programme in question, further information is available in the degree structures in the study guide.

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

Pass/Fail. Internship report 100 %.

Course Materials:

Instructions: https://uni.lut.fi/en/web/lut.fi-eng/internship6

Places for exchange-students? (Yes, number/No):

No

Places for Open University Students?(Yes, number/No):

No

YmDSustaDD: Sustainability Science and Solutions, Double Degree, 40 - 70 cr

Validity: 01.08.2016 -
Form of study: Major studies
Type: Study module
Unit: LUT School of Energy Systems
Grading: Study modules 0-5,P/F

No course descriptions.

Obligatory Studies 60 ECTS cr

BH60A5000: Master's Thesis, 30 cr

Validity: 01.08.2015 -
Form of study: Basic studies
Type: Master's Thesis
Unit: LUT School of Energy Systems
Teachers: Risto Soukka

Year:

M.Sc. (Tech.) 2

Period:

1-4

Teaching Language:

English

Teacher(s) in Charge:

Professor, D.Sc. (Tech.) Risto Soukka

Aims:

Upon completion of the course the student is expected to be able to:
1. define a research problem,
2. choose and apply research methods relevant to the research problem,
3. search for suitable reference material, and assess the quality and reliability of the material and the information it contains,
4. use and interpret reference material correctly and diversely,
5. report on his or her work in writing, taking into account language and layout requirements, and
6. give a concise oral presentation on the content and results of the work.

Contents:

The thesis is a research or a planning project. Students must demonstrate the ability to complete the project independently and following a plan. A report is prepared following the instructions for the Master',s thesis.

Teaching Methods:

The presentation of the thesis will be arranged with the supervising professor. There will not be a separate seminar. Total workload approx. 780 h.

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

0 - 5. Master',s Thesis 100 %.

Course Materials:

-

Places for exchange-students? (Yes, number/No):

No

Places for Open University Students?(Yes, number/No):

No

BH60A4600: Introduction to M.Sc. Studies, 1 cr

Validity: 01.08.2013 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Energy Systems

Grading: Study modules 0-5,P/F

Teachers: Marjaana Lehtinen, Aki-Pekka Grönman, Sanni Väisänen, Risto Soukka, Katja Hynynen

Note:

Lectures together withall students of International Master's programs in Energy Technology, Electrical Engineering, Mechanical Engineering and Sustainability Science and Solutions.
Lectures for students of MSc programme in Circular Economy will be arranged in Lahti or online (announced in the beginning of the course).

Year:

M.Sc. (Tech.) 1

Period:

1-2

Teaching Language:

English

Teacher(s) in Charge:

Post-Doctoral Researcher, TkT Sanni Väisänen
Post-Doctoral Researcher, TkT Katja Hynynen
Associate Professor, TkT Ahti Jaatinen-Värri
University Lecturer, TkT Kimmo Kerkkänen

Aims:

Upon completionof the course the student is expected to be able to:
1. describe the content of the Degree Programme, interpret the study guide andalso describe the research areas of School of Energy Systems,
2. prepare his/her individual study plan (ePSP) and follow the progress ofhis/her studies with the help of WebOodi's personal study plan,
3. observe the university's examination practices and degree programmepractices (incl. instructions of the Master's Thesis),
4. use the services of the library, retrieve information independently and usethe information sources in accordance with good practices, and also toobserve the copyrights,
5. understand how to manage the studies and how to find help when needed duringhis/her studies,
6. use the Moodle learning environment,
7. knowshow to improve information security during his/her daily use ofuniversity networks,
8. understandthe concept of career planning and use the services of career services,
9. understand the concept of cultural differences and how it mighteffect on his/her daily social intercourse.

Contents:

Getting to know the School of EnergySystems and the Master's programs Studies (incl. Master's Thesis). Studyand exam culture in LUT. LUT library collections, databases,reference practices, and copyrights, information security, career planningand cultural difference related issues. Study Skills and Motivation. ePSPworkshop. Research areas of School of Energy Systems. The course is related to sustainability.

Teaching Methods:

1st and 2nd period: 15 hof obligatory lectures (incl. participation in an ePSP workshop. 1stperiod: Information security training and Information searchning web courses (2+ 5 h). 2nd period: Individual discussion with a teacher tutor 1 h. Individualwork 3 h. Total workload 26 h.

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

Pass/fail. Passing the course requires attendance at the lectures, ePSP, passing individual Information security training and Information searching web courses, written assignment, and discussion with teacher tutor.

Course Materials:

Study Guide, Moodle, LUT library collections, and databases.

Places for exchange-students? (Yes, number/No):

No

Places for Open University Students?(Yes, number/No):

No

BH60A0252: Solid Waste Management Technology, 7 cr

Validity: 01.08.2016 -
Form of study: Basic studies
Type: Course
Unit: LUT School of Energy Systems
Grading: Study modules 0-5,P/F
Teachers: Jouni Havukainen, Mika Luoranen, Mika Horttanainen

Year:

M.Sc. (Tech.) 1

Period:

1-2

Teaching Language:

English

Teacher(s) in Charge:

Professor, D.Sc. (Tech.) Mika Horttanainen

Aims:

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.

Contents:

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.

Teaching Methods:

1st period: 14 h of lectures, 10 h of tutorials. 2nd period: 12 h of lectures, 8 h of tutorials. Assignment with literature and calculation part, presentation, individual work approx. 82 h. Field trip approx. 12 h. Lecture assignments approx. 10 h. Examination and preparation for it approx. 30 h. Total workload 182 h.

Examination in Examination schedule (Yes/No):

Yes

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

0 - 5. Examination 50 %, assignment 40 %, lecture assignments 10 %.

Course Materials:

Tchobanoglous, Theisen, Vigil: Integrated Solid Waste Management, 1993. Handouts provided by the lecturer, course environment on Moodle.

Prerequisites:

BH60A0001 Ympäristötekniikan perusteet, BH60A0901 Ympäristömittaukset or equivalent knowledge

Places for exchange-students? (Yes, number/No):

max 15

Places for Open University Students?(Yes, number/No):

max 10

BH60A0451: Air Pollution Control, 6 cr

Validity: 01.08.2016 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Energy Systems

Grading: Study modules 0-5,P/F

Teachers: Risto Soukka, Ville Uusitalo

Year:

M.Sc. (Tech.) 1-2

Period:

1-2

Teaching Language:

English

Teacher(s) in Charge:

Professor, D.Sc. (Tech.) Risto Soukka

Aims:

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

Contents:

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

Teaching Methods:

14 h of lectures, 1st - 2nd period. 20 h of lectures, 1st - 2nd period. Option for study trip 8 h. Independent work (approx. 114 h): Assignment, approx. 60 h, Examination and preparation for it, approx. 54 h. Total workload 156 h.

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

Yes

Assessment:

0 - 5. Examination 50 %, assignment 50 %.

Course Materials:

De Nevers Noel: Air Pollution Control Engineering, Cooper: Air Pollution Control - A Design Approach. Moodle.

Places for exchange-students? (Yes, number/No):

max 5

Places for Open University Students?(Yes, number/No):

max 5

BH60A0652: Sustainable Water Use, 6 cr

Validity: 01.08.2016 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Energy Systems

Grading: Study modules 0-5,P/F

Teachers: Heli Kasurinen, Risto Soukka

Year:

M.Sc. (Tech.) 2

Period:

1-2

Teaching Language:

English

Teacher(s) in Charge:

Professor, D.Sc. (Tech.) Risto Soukka

Aims:

Upon completion of the course the student is expected to be able to
1. define the key concepts of water pollution control,
2. explain the operation of essential process technology and equipment related to the control of water pollution,
3. compare and give grounded proposals for treatment methods and processes applicable to different situations,
4. apply legislation and official regulations related to water pollution control and sludge treatment,
5. apply means to protect groundwater,
6. apply means to reduce the environmental load of surface waters,
7. describe the key factors that can affect the water footprint,
8. describe the measures for the environmentally friendly management of by-product flows, and
9. compare the economic efficiency of different wastewater treatment methods.

Contents:

Sustainability challenges of water use. Water supply, water use in different sectors and loading of water systems. Wastewater treatment in industry and municipalities. Sludge treatment. Production of drinking water. Protection of groundwater deposits.

Teaching Methods:

1st - 2nd period: 14 h of lectures. 1st - 2nd period: tutorials and independent exercises 20 h. 1st - 2nd period: Assignment approx. 60 h. 1st or 2nd period: Field trip approx. 8 h. Examination and preparation for it approx. 54 h. Total workload 156 h.

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

Yes

Examination in Exam (Yes/No):

Yes

Assessment:

0 - 5. Examination 50 %, assignment 50 %.

Course Materials:

Tchobanoglous: Wastewater Engineering. Treatment and Reuse, 2003. Handouts provided by the lecturer, course environment on Moodle.

Prerequisites:

BH60A0001 Ympäristötekniikan perusteet or equivalent knowledge.

Places for exchange-students? (Yes, number/No):

No

Places for Open University Students?(Yes, number/No):

max 5

BH60A2101: Advanced Course in Life Cycle Assessment, 7 cr

Validity: 01.08.2010 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Energy Systems

Grading: Study modules 0-5,P/F

Teachers: Ivan Deviatkin, Risto Soukka, Sanni Väisänen

Note:

Suitable also for doctoral studies.
In order to take the course, the student should have own laptor computer with Windows

Year:

M.Sc. (Tech.) 1

Period:

3-4

Teaching Language:

Finnish and English

Teacher(s) in Charge:

Professor, D.Sc. (Tech.) Risto Soukka

Aims:

Upon completion of the course the student is expected to be able to
1. explain the basic life cycle concepts,
2. plan, implement and analyse assessments to select products and services which fulfil the requirements of sustainable development,
3. plan, implement and analyse assessments to reveal development needs of products and services,
4. recognise the most inexpensive ways to reduce the environmental impact, and
5. perform life cycle assessments using software
6. apply theories to find and develop the most sustainable product, process or system design.

Contents:

Introduction to life cycle assessment, carrying out life cycle assessment, aspects related to inventory analysis, aspects related to impact assessment, calculating a carbon footprint, introduction to life cycle costing, aspects related to life cycle costing, LCA and LCC examples. This course is also suitable for postgraduate students.

Teaching Methods:

3rd period: 10 h of lectures, 3 h of computer training. Assignment 1 with a Quiz, literature and computational part, individual and pair work (approx. 38 h).
4th period: 4 h of lectures, 4 h of computer training. Assignment 2 with Life cycle modelling task, final report and result presentation meeting, group work (approx. 82 h).
Examination and preparation for it (approx. 41 h). Total workload 182 h.

Suitability for doctoral studies (Yes/Leave empty):

Yes

Doctoral School course where enrollment is in WebOodi (Yes/Leave empty):

Yes

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

Yes

Assessment:

0 - 5. Assignments 75 %, examination 25 %.

Course Materials:

Walter Klöpffer, Birgit Grahl Life Cycle Assessment (LCA), A Guide to Best Practice.
Moodle. Standards ISO 14040 and ISO 14044.

Prerequisites:

Recommended: BH60A2401 Energy Recovery from Solid Waste and BH60A0252 Solid Waste Management Technology and BH60A1600 Basic Course on Environmental Management and Economics.

Places for exchange-students? (Yes, number/No):

max 10

Places for Open University Students?(Yes, number/No):

max 5

BH60A4400: Introduction to Sustainability, 3 cr

Validity: 01.08.2013 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Energy Systems

Grading: Study modules 0-5,P/F

Teachers: Risto Soukka, Virgilio Panapanaan, Mirja Mikkilä

Year:

M.Sc. (Tech.) 1

Period:

1

Teaching Language:

English

Teacher(s) in Charge:

Professor, D.Sc. (Tech.) Risto Soukka

Aims:

Upon completion of the course the students are expected to be able to:
1) explain the interaction between the environment, society and business and understand the relationships of various actors in these fields and their impacts on the society and the environment,
2) understand the core idea and thinking behind sustainability and its importance in order to limit or decelerate environmental damages and improve our quality of life while pursuing a more sustainable lifestyle and business within the planetary boundaries,
3) understand and apply practically the learned principles and concepts of sustainability in relation to current production and consumption habits,
4) know and be guided about the different value-adding activities and tools that promote sustainability

Contents:

The idea is to learn and understand sustainability challenges and their interconnectedness, and find out how we could move or transit towards a more sustainable world.

Teaching Methods:

1st period: 14 h of lectures. Independent study (approx. 64 h): assignment (group work) and seminar (approx. 26 h). Preparation for the examination and the exam (approx. 38 h). Total workload 78 h.

Suitability for doctoral studies (Yes/Leave empty):

Yes

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

Yes

Examination in Exam (Yes/No):

No

Assessment:

0 - 5. Examination 60 %, assignment 40 %.

Course Materials:

Will be announced during lectures. Moodle.

Places for exchange-students? (Yes, number/No):

max 5

Places for Open University Students?(Yes, number/No):

max 5

YMSSSDDVal: Free elective studies, 0 - 100 cr

Validity: 01.08.2018 -
Form of study: Elective studies
Type: Study module
Unit: LUT School of Energy Systems
Grading: Study modules 0-5,P/F

No course descriptions.

Chooose at least 10 ECTS cr from following courses

A350A0500: Sustainable Strategy and Business Ethics, 3 cr

Validity: 01.08.2013 -
Form of study: Basic studies
Type: Course
Unit: LUT School of Business and Management
Grading: Study modules 0-5,P/F
Teachers: Karl-Erik Michelsen, Paavo Ritala, Laura Olkkonen

Note:

Only Master-level students, i.e those that have completed a Bachelor's degree or equivalent before the beginning of the course, are allowed to enroll.

Year:

M.Sc. (Econ. & Bus. Adm.) 1

Period:

2

Teaching Language:

English

Teacher(s) in Charge:

Professor, D.Sc. Paavo Ritala

Professor, Ph.D. Karl-Erik Michelsen
Post-doctoral Researcher, Ph.D. Laura Olkkonen

Aims:

This course concentrates on the topical phenomena and concepts related to the creation and development of sustainable strategy, shared value creation and business ethics in organisations. The concepts will be investigated both from the viewpoints of academic research and practical relevance. Students will learn to discuss and synthesize the recent literature, examine the links of contemporary topics to previous research and assess the practical relevance of the issues through concrete examples. The learning outcomes of the course are the following:
1.To assess the topics of sustainable strategy and business ethics in the firm level as well as within the broader institutional context from both academic and practitioner perspectives.
2.To discuss and debate on the conflicting perspectives of sustainability and ethics in business.
3. To be able to analyze the practical relevance of sustainable business strategy

Contents:

The content of the course is based on topical issues related to sustainable strategy and business ethics from different approaches.
The core content includes: - Basics of sustainability and ethics in business context - Recent trends and developments of sustainable strategy and corporate responsibility - Sustainability issues in the supply network - Key business ethics challenges

Teaching Methods:

In-class hours: 2. period: 12 hours of lectures, 6 hours of interactive theme sessions and seminars, and an interactive panel session with business and societal experts (4 hours).
Out-class hours: Preparation for the theme sessions and seminars: 8 h. Course assignment in groups 50 h. Total hours: 80 h.

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

No written exam. Final grade 0-5. 100 points based on course assignment conducted in groups.

Course Materials:

Academic and practitioner-oriented articles on sustainability and business ethics. Readings list distributed in Moodle.

Prerequisites:

Only Master-level students, i.e. those that have completed a Bachelor's degree or equivalent before the beginning of the course, are allowed to enroll.

Places for exchange-students? (Yes, number/No):

max 10

Places for Open University Students?(Yes, number/No):

max 5

BH50A0400: Water Treatment, 2 cr

Validity: 01.08.2007 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Energy Systems

Grading: Study modules 0-5,P/F

Teachers: Kari Luostarinen, Esa Vakkilainen

Note:

Course registaration by e-mail to the assistant.
Self-study and an examination in Moodle.

Year:

M.Sc. (Tech.) 1

Period:

1-4

Teaching Language:

Finnish

Teacher(s) in Charge:

Professor, D.Sc. (Tech.) Esa Vakkilainen, Research assistant, M.Sc. (Tech.) Kari Luostarinen

Aims:

Upon completion of the course the students will be able to 1. describe the production methods of the water used in power plants, 2. define the fundamental chemistry of water treatment, 3. describe the water quality measurement methods, 4. recognise the damages and danger situations caused by the water impurities, and 5. apply the information on water treatment processes essential for energy production.

Contents:

The fundamentals of water treatment in brief. Water analytics. The production of process water and especially of makeup water for power plants. The influence of impurities on the water-steam cycle. Preservation of power plants.

Teaching Methods:

100 % online course in Moodle. Self-study: Preparation for the examination 8 h and the examination in Moodle 3 h. Material study 41 h.
Total workload 52 h.

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

Yes

Examination in Exam (Yes/No):

No

Assessment:

0 - 5. Examination in Moodle 100 %.

Course Materials:

Buecker, Brad, Fundamentals of steam generation chemistry, PennWell, 2000.
Material in Moodle.

Places for exchange-students? (Yes, number/No):

No

Places for Open University Students?(Yes, number/No):

max 10

BH60A0150: Project work 1, 2 - 10 cr

Validity: 01.08.2014 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Energy Systems

Grading: Study modules 0-5,P/F

Teachers: Maija Leino, Risto Soukka

Note:

The course starts at the intensive week 43.

Year:

B.Sc. (Tech.) 2

Period:

2-4

Teaching Language:

Finnish

Teacher(s) in Charge:

Professor, D.Sc. (Tech.) Risto Soukka

Aims:

Upon completion of the course the student will be able to act as an active member of an interdisciplinary project team in different roles. Depending on her/his role in the project, the student can:
1. describe the outline of the project plan and apply different methods to divide the project into subtasks and to schedule the project,
2. prepare a budget for the project and monitor it,
3. document the group's and her/his project work results both orally and in writing,
4. reflect her/his actions as a member of the team and assess the outcome of the project and the other team members' work,
5. recognise the key elements in project risk management,
6. apply knowledge and skills acquired in other courses to complete the project.

Contents:

Varying themes according to the project.

Teaching Methods:

Project management lectures in intensive week 43. Working in a project as a member of a project team in different roles and tasks e.g. related to generating ideas, planning, dimensioning, construction, manufacturing, measuring and testing, documentation, management and negotiations. Continuous self-assessment, evaluation of the project group work and the outcome of the project e.g. with a learning and /or project diary.

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

1-5. The course is evaluated based on the work done in the project and its appropriate documentation, by student self-assessment and by teachers and peers. The number of credits obtained depends on the scope of work done in the project, and therefore, comprehensive documentation, monitoring and reporting on the project are key elements in the evaluation. The number of credits might be defined already before the start of the project.

Course Materials:

Case-specific.

Places for exchange-students? (Yes, number/No):

No

Places for Open University Students?(Yes, number/No):

No

BH60A4301: Environmental Technology Project Work, 2 - 7 cr

Validity: 01.08.2016 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Energy Systems

Grading: Study modules 0-5,P/F

Teachers: Lassi Linnanen, Mika Horttanainen, Risto Soukka

Note:

The students register for the course be contactiong the professor (Master',s degree students)/supervisor (exchange students), with an idea of the topic.

Year:

M.Sc. (Tech.) 1-2

Period:

1-4

Teaching Language:

English

Teacher(s) in Charge:

Professor, D.Sc. (Tech.) Risto Soukka, Professor, D.Sc. (Tech.) Mika Horttanainen, Professor, D.Sc. (Econ. & Bus. Adm.), M.Sc. (Tech.) Lassi Linnanen

Aims:

Upon completion of the course the student is expected to be able to:
1. choose appropriate research methods for a research problem in a given field of environmental technology,
2. find and select appropriate reference material for research,
3. independently make the timetable and conduct a compact research project, and
4. prepare a written report on his/her work according to instructions.

Contents:

Producing a research report on a given subject on the basis of a literature review. The subject of the research can also be assigned by an enterprise.

Teaching Methods:

1st-4th periods: Advanced practical or seminar work 50 - 780 h, (=,independent work). The method of completion is agreed on with the supervising professor. No contact teaching.

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

0 - 5. Project work 100 %.

Course Materials:

Case-specific

Prerequisites:

The prerequisites are set individually depending on the case.

Places for exchange-students? (Yes, number/No):

max 5

Places for Open University Students?(Yes, number/No):

max 5

BH50A2200: Bioenergy and Energy Use in the Forest Industry, 6 cr

Validity: 01.01.2018 -
Form of study: Basic studies
Type: Course
Unit: LUT School of Energy Systems
Grading: Study modules 0-5,P/F

Year:

M.Sc. (Tech.) 2

Period:

3-4

Teaching Language:

English

Teacher(s) in Charge:

Professor, D.Sc. (Tech.) Esa Vakkilainen

Aims:

Upon completion of the course the students will be able to recognize the importance of forest industry to economy, can describe processes used, understands the role of biomass, recycling and bioenergy, can evaluate and understand the energy use of basic processes, explain the importance of energy procurement for forest industry mill. Understands the factors that determine effective energy use and production. Can draw the energy procurement plan for a forest industry mill.

Contents:

Principles of producing chemical kraft pulp and process energy use. Importance of bioenergy and biofuels in forest industry. Project planning and execution. Engineering design: Students develop energy procurement plan for given forest industry mill through team and project work. Modelling of the power plant for the planning. Energy use for plant subprocesses. The dimensioning and optimisation of energy delivery. Thermal engineering simulation. Compare factors affecting the power plant economics. Documentation of results.

Teaching Methods:

3rd period: 10 h of lectures and planning tutorials. 4th period: 8 h of planning tutorials. Assignment. Exam. Independent study approximately: Written assignment 80 h. Studying given material 52 h. Exam 3 h.
Total workload 156 h.

Examination in Examination schedule (Yes/No):

Yes

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

0 - 5. Examination 70%, written report of the engineering design assignment 30 %.

Course Materials:

Lecture notes.

Places for exchange-students? (Yes, number/No):

max 5

Places for Open University Students?(Yes, number/No):

max 5

BK50A2701: Selection Criteria of Structural Materials, 5 cr

Validity: 01.08.2016 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Energy Systems

Grading: Study modules 0-5,P/F

Teachers: Harri Eskelinen, Jörg Wunderlich, Sari Pärssinen

Note:

The course is arranged concurrently in face-to-face learning and distance learning environment. Replaces the course BK10A2900 Konstruktiomateriaalit ja niiden valinta JEDI

Year:

M.Sc. (Tech.) 1

Period:

3-4

Teaching Language:

English

Teacher(s) in Charge:

Professor, D.Sc. (Tech.) Harri Eskelinen

Aims:

After having passed this course module the student is able to:
- apply and develop systematic and analytical means and tools of systematic material selection approaches into solving cross-technological material selection tasks
- define and analyse the properties, the strengths, the weaknesses and the application areas of the main groups of constructional materials for different types of applications
- is able to justify and build generalized models to take into a count both the functionality and the manufacturability aspects in addition to the total costs and environmental aspects of the product in solving the material selection task
- is able to evaluate and utilize recent results and documents of material science
- derive analytical models based on the principles of LCC’s, LCA’s and MIPS-factors in material selection.

Contents:

During the course the student will become familiar with the properties and application areas of different constructional materials. The recent scientific results dealing with material science and technology will be discussed. Aspects of selecting and comparing different materials are discussed from the viewpoints of functionality, manufacturing aspects, costs and environmental aspects of the product. Future trends in materials science are discussed briefly. Metals and their alloys, polymers, ceramics, composites, wood materials, adaptive materials, nanomaterials. Environmental aspects of material selection from the viewpoint of

LCC and LCA and the basics of MIPS calculations. Innovative solutions of the material selection tasks will be discussed. Principles to formulate and solve the materials solution tasks based on analytical and systematic approaches and means to develop models to support the selection process staring from the product's requirement list will be discussed in details. Multi-language teaching environment will be utilized during the project work.
Project work focuses to selecting structural materials for industrial applications.

Teaching Methods:

For face-to-face learning (3-4 period): Introduction lecture 2 h, 3rd period. Learning diary 36 h, 3rd-4th period. Exercises in small teams 28 h, 3rd-4th period. Project work and poster presentation 44 h, 3rd-4th period. Independent study 20
h. Total workload 130 h.
For distance learning (non-stop):Project work 60 h, Independent study 68 h, Skype-exam and-meetings 2 h.
The course is suitable for distance learning.

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

For face-to-face learning, 0-5, comprehensive and continuous evaluation 50 %, project work 50 %
For distance learning: 0-5, Skype-exam 50 %, project work 50 %

Course Materials:

Mangohon, P., The Principles of Materials Selection for Engineering Design. Strong, A. B., Plastics, Materials and Processing. Kalpakjan, S. & Schmid, S., Manufacturing Engineering and Technology. Lectures and exercises in Moodle. For Finnish students and distance learning: Eskelinen &
Karsikas, Vihreän teknologian näkökulmat konstruktiomateriaalien valinnassa, ISBN 978-952-265-457-1.

Limitation for students? (Yes, number, priorities/Leave empty):

The possibility to pass the course via distance learning is meant only for students of LUT's distance learning programs.

Places for exchange-students? (Yes, number/No):

No

Places for Open University Students?(Yes, number/No):

No

BL40A2600: Wind power and solar energy technology and business, 5 cr

Validity: 01.08.2013 -
Form of study: Basic studies
Type: Course
Unit: LUT School of Energy Systems
Grading: Study modules 0-5,P/F
Teachers: Katja Hynynen, Olli Pyrhönen

Year:

B.Sc. (Tech.) 3

Period:

3-4

Teaching Language:

Finnish

Teacher(s) in Charge:

D.Sc. (Tech.) Katja Hynynen

Aims:

Upon completion of the course the student will be able to: 1. model the process from wind energy into company turnover at the principle level, 2. identify and describe the key technologies related to wind power, the core business principles, environmental issues,
energy policy and their development trends, 3. describe the mutual effects of wind power and electric power systems, 4. identify and describe the technologies related to solar power., 5. describe the basic principle of photovoltaic cells, 6. estimate the performance and
profitability of a PV plant.

Contents:

Process modelling from kinetic energy of wind into company turnover and from solar radiation to turnover. Basic components of a wind
power plant (turbine, gearbox, generator, power electronics, power electronics, tower), environmental effects of wind power, wind park planning, grid effects of wind power, economic feasibility of wind power under different circumstances, wind conditions in Finland. Solar energy technologies, operating principle of solar panels, PV solar power plant structure.

Teaching Methods:

Lectures 14 h, homework, 3rd period. Lectures 14 h, 4th period. Weekly homework. Two assignments. Total workload 130 h.

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

0-5, project works 60 %, homework 40 %.

Course Materials:

Material handed out in class. Moodle.

Prerequisites:

Basics of physics (mechanics, thermodynamics, electricity)

Places for exchange-students? (Yes, number/No):

No

Places for Open University Students?(Yes, number/No):

max 5

CS31A0610: Life-Cycle Costing of Investment Projects, 6 cr

Validity: 01.08.2016 -
Form of study: Basic studies
Type: Course
Unit: LUT School of Business and Management
Grading: Study modules 0-5,P/F
Teachers: Sini-Kaisu Kinnunen, Timo Kärri

Note:

Can't be included into a same degree as CS31A0603 Life-Cycle Costing of Investment Projects.

Year:

M.Sc. 1-2

Period:

1

Teaching Language:

Finnish

Teacher(s) in Charge:

Professor, D.Sc. (Tech.) Timo Kärri
M.Sc. (Tech.) Sini-Kaisu Kinnunen

Aims:

After completing the course students will be able to:
- prepare and evaluate investment proposals
- analyze requirements of sustainability during the life-cycle of projects.

Contents:

Investment proposal. Life-cycle of investment project, life-cycle costs and profits, capital costs, initial investment and working capital, classification and selection of projects, uncertainty and risks. Evaluation methods introduced: net present value, internal rate of return, return on investment, payback period, benefit-cost ratio and profitability index. Investment process, timing and financing of projects, public-private partnership, life-cycle models of machine replacements, concept of real option, evaluation of projects from the perspective of sustainability.

Teaching Methods:

Lectures 26 h, exercises 10 h, micro-execises 9 h, homeworks 12 h, individual tasks 64 h, preparation for exam and exam 36 h, 1. period. Total 157 h.

Examination in Examination schedule (Yes/No):

Yes

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

0 - 5. Exam, extra points from assignments.

Course Materials:

Lecture notes (2 copies). Mott, Graham: Investment appraisal. Pitman Publishing, 1997, (196 p.). Götze U. et al: Investment appraisal - Methods and models. Springer. 2008, (341 p.)

Prerequisites:

CS31A0102 Kustannusjohtamisen peruskurssi

Places for exchange-students? (Yes, number/No):

No

Places for Open University Students?(Yes, number/No):

max 5

CT10A7004: Sustainability and IT, 6 cr

Validity: 01.08.2018 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Business and Management

Grading: Study modules 0-5,P/F

Teachers: Jari Porras

Note:

This course is meant only for the fulltime students of the software engineering programme.

Year:

M. Sc. 1

Period:

3-4

Teaching Language:

English

Teacher(s) in Charge:

Prof., D.Sc. (Tech.) Jari Porras

Aims:

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

Contents:

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.

Teaching Methods:

This course follows flipped classroom approach. Introductory lectures are used for introducing the lecture material and dividing students into smaller groups.
Lectures 2 h, Mandatory classroom discussions 8 h, Homeworks 16 h, Reading assignments 24h, Period 3.
Lectures 6h, Mandatory classroom discussions 8h, Homeworks 16 h, Reading assignments 24 h, Project work 52 h, Period 4
Total 156 h.

Assessment:

0-5 continuous evaluation (no exam)
Presentation(s) 10%
Discussions 20%
Individual homeworks (x2) 20%
Group based homeworks (x2) 20%
Project 30%

Course Materials:

Murugesan S. & Gangadharan G.R.: Harnessing Green IT - Principles and practices, Wiley, 2012, 433 p
Tomlinson B.: Greening through IT - Information Technology for Environmental Sustainability, MIT Press, 2010, 221 p
A set of yearly changing scientific articles that will be announces at the moodle pages of the course.

Limitation for students? (Yes, number, priorities/Leave empty):

This course is meant only for the full time students of the software engineering programme

Places for exchange-students? (Yes, number/No):

max 10

KIEN0017: Academic Writing, 3 cr

Validity: 01.08.2018 -
Form of study: Language and communication studies
Type: Course
Unit: Language Center
Grading: Study modules 0-5,P/F

No course descriptions.

KIEN0006: English for Professional Development (Technology), 4 cr

Validity: 01.08.2018 -
Form of study: Language and communication studies
Type: Course
Unit: Language Center
Grading: Study modules 0-5,P/F

No course descriptions.

KIEN0015: Effective Presentations, 2 cr

Validity: 01.08.2018 -
Form of study: Language and communication studies
Type: Course
Unit: Language Center
Grading: Study modules 0-5,P/F

No course descriptions.

KIEN0013: Meetings and Discussions, 3 cr

Validity: 01.08.2018 -
Form of study: Language and communication studies
Type: Course
Unit: Language Center
Grading: Study modules 0-5,P/F

No course descriptions.

BH60A3700: Work internship in Master's degree, 2 - 10 cr

Validity: 01.08.2012 -
Form of study: Basic studies
Type: Practical training
Unit: LUT School of Energy Systems
Grading: Study modules 0-5,P/F
Teachers: Lassi Linnanen, Simo Hammo

Year:

M.Sc. (Tech.) 1-2

Period:

1-4

Teaching Language:

Finnish

Teacher(s) in Charge:

Laboratory Engineer, Lic.Sc. (Tech.) Simo Hammo

Aims:

After the work environment internship, the student will have the basic knowledge of work, working environment and working community in his/her own field. The student will be able to apply the knowledge and skills acquired during the course of studies to work in his/her own field.

Contents:

The student obtains a (summer) job from the company, works there as a paid employee, requests for a certificate of employment and applies for the approval of the work as an internship for the Master's degree. Full-time employment relationships of at least four weeks can be approved as internships. The completion of the Master's thesis is not accepted as an internship. An employment relationship preceeding the studies can be approved as an internship, provided that it has not been accepted and included in any other previous degree.

Teaching Methods:

The first 2 ECTS credits: applying for a job and recruiting 10 h, tasks connected to beginning of an employment relationship (e.g. orientation, the rules of the employment relationship and the workplace) 15 h, observing (while working) how the working community operates (e.g. how work/production is organized, supervision, the working manners of the working community/teams, the social environment of the workplace) 22 h, a written internship report 5 h (2 - 3 pages), total workload 52 h. 3 - 10 ECTS credits: having different tasks in a company 26 - 208 h (1 ECTS credit/26 h). The number of ECTS credits of compulsory internship varies depending on the degree programme in question, further information is available in the degree structures in the study guide.

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

Pass/Fail. Internship report 100 %.

Course Materials:

Instructions: https://uni.lut.fi/en/web/lut.fi-eng/internship6

Places for exchange-students? (Yes, number/No):

No

Places for Open University Students?(Yes, number/No):

No

Descriptions of courses and study modules not included in the degree structures

EnSaM150: Energy Technology, extensive, 20 - 25 cr

Validity: 01.08.2005 -
Form of study:
Type: Study module
Unit: LUT School of Energy Systems
Grading: Study modules 0-5,P/F

Aims:
Energiatekniikka (laaja) sivuopintokokonaisuuden suoritettuaan opiskelija:
• ymmärtää syvällisemmin erilaisten voimalaitosprosessien toimintaa ja ymmärtää niiden suunnitteluperiaatteet
• osaa, mielenkiintonsa valintansa mukaan, suunnitella yksinkertaisia energiatekniikan prosesseja ja laskea niihin kuuluvien komponenttien mitoitus- ja toiminta-arvoja.
HUOM. Esitietovaatimuksena Energiatekniikan sivuopintokokonaisuuden suorittaminen.

Valitse energiatekniikan laajaan sivuopintokokonaisuuteen 20-25 op. Esitietovaatimuksena Energiatekniikan sivuopintokokonaisuuden suorittaminen.Jos opiskelija ei ole suorittanut BH40A0301 Energianmuuntoprosesseja, on se valittava tähän sivuopintokokonaisuuteen.

BH20A0451: Heat Transfer, 4 cr

Validity: 01.08.2017 -
Form of study: Basic studies
Type: Course
Unit: LUT School of Energy Systems
Grading: Study modules 0-5,P/F
Teachers: Timo Hyppänen

Year:
B.Sc. (Tech.) 3
Period:
3-4
Teaching Language:
Finnish
Teacher(s) in Charge:
Professor, D.Sc. (Tech.) Timo Hyppänen
Aims:
Upon completion of the course the students will be able to 1. describe the physical phenomena and conservation equations related to heat transfer by conduction, convection and radiation, 2. use the solution methods when analysing engineering heat transfer applications 3. define the radiation properties of surfaces and gases and apply the reduction of radiation resistance network and solution of the linear system of equations in the case of heat transfer in enclosures, 4. solve and analyse the problems in the special cases of heat convection with the help of boundary layer theory and heat transfer correlations, 5. apply the numerical solution method and use empirical graphs when solving basic stationary and unsteady heat conduction cases, and 6. act as a member of a group analysing the heat transfer of an industrial application, present the results briefly, and discuss the thermal performance of the application. In addition, the students will be able to create thermal engineering design of therelated heat transfer equipment.

Contents:

Radiation in enclosures, gas radiation, conservation equations of convection and solutions of special cases, unsteady heat conduction, numerical solution methods for stationary and unsteady heat conduction cases.

Teaching Methods:

3rd period: 12 h of lectures, 12 h of tutorials.4th period: 2 h of lectures, 4 h of tutorials, seminar + preparation 12 h. Examination 3 h + preparation 45 h. Compulsory homework 14 h and tutorials. Total workload 104 h.

Examination in Examination schedule (Yes/No):

Yes

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

0-5. Written examination, home work and seminar.

Course Materials:

Lecture notes.
Incropera, De Witt: Fundamentals of Heat and Mass Transfer.
Holman J.P.: Heat Transfer.

Prerequisites:

Students are required to have attended the lectures of BH20A0300 Fundamentals of Heat Transfer, tutorials completed.

Places for exchange-students? (Yes, number/No):

No

Places for Open University Students?(Yes, number/No):

No

BH30A0201: Nuclear Reactor Design, 6 cr

Validity: 01.08.2016 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Energy Systems

Grading: Study modules 0-5,P/F

Teachers: Anne Jordan, Juhani Hyvärinen

Note:

This course is available only to nationals of countries that have implemented adequate nuclear non-proliferation under the rules of the International Atomic Energy Agency (IAEA).

Year:

M.Sc. (Tech.) 1

Period:

1-2

Teaching Language:

English

Teacher(s) in Charge:

Professor, D.Sc. (Tech.) Juhani Hyvärinen

Aims:

Upon completion of the course the students will be able to explain physical phenome underlying nuclear reactors, and perform engineering design of a critical nuclear reactor using diffusion theory, and perform thermal engineering design of the reactor core. Students will learn the main characteristics of commercially important nuclear reactor types.

Contents:

Interaction of radiation with matter. Nuclear reactions and their cross sections. Reactor physics, diffusion theory, a simplified criticality calculation. The design principles for the reactor core, thermal dimensioning. An overview at the nuclear power programmes of different countries. Major reactor commercial nuclear types: PWR, BWR, Small Modular Reactors, CANDU and RBMK, gas-cooled reactors, and fast reactors.

Teaching Methods:

Lectures 28 h, tutorials 14 h, country presentation 20 h, preparation for the interim exam 13 h and interim exam 3 h, 1st period. Lectures 14 h, tutorials 14 h, assignment 39 h, preparation for the interim exam 8 h and interim exam 3 h, 2nd period. Assignment and country presentation. Two written interim exams or one written final examination.
Total workload 156 h.

Examination in Examination schedule (Yes/No):

Yes

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Number of mid-term examinations:

2

Assessment:

0-5. Written examination 70 %, assignment and country presentation 30 %. Possible to raise the grade by tutorials.

Course Materials:

Lecture notes.
Lamarsh & Baratta: Introduction to Nuclear Engineering, 3rd edition (2014), where applicable.

Prerequisites:

BH30A0001 Introduction to Nuclear Energy or equivalent skills.

Places for exchange-students? (Yes, number/No):

max 10

Places for Open University Students?(Yes, number/No):

max 5

BH30A0302: Nuclear Power Plant Engineering, 6 cr

Validity: 01.08.2016 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Energy Systems

Grading: Study modules 0-5,P/F

Teachers: Anne Jordan, Juhani Hyvärinen

Note:

This course is available only to nationals of countries that have implemented adequate nuclear non-proliferation under the rules of the International Atomic Energy Agency (IAEA).

Year:

M.Sc. (Tech.) 1

Period:

3-4

Teaching Language:

English

Teacher(s) in Charge:

Professor, D.Sc. (Tech.) Juhani Hyvärinen

Aims:

Upon completion of the course the students will be able to explain the functional principles of nuclear power plants and perform engineering design of main heat transfer and power conversion processes. The student will learn elements of engineering design of light water reactor plants process components (excluding the reactor core) and radiation shielding. The student understands nuclear fuel cycle and related technologies, can manage nuclear waste and apply nuclear safety principles.

Contents:

Nuclear reactor as heat source. Power conversion in light water reactor power plants. Main process systems and safety systems of light water reactors. Health effects of ionising radiation, radiation protection. Nuclear fuel cycle, nuclear waste management. Nuclear safety in design, major nuclear accidents.

Teaching Methods:

Lectures 14 h, tutorials 14 h, presentation 25 h, independent study 22 h, interim exam 3 h, 3rd period. Lectures 14 h, tutorials 14 h, assignment 25 h, independent study 22 h, interim exam 3 h, 4th period. Assignment and presentation. Two written interim exams or one written final examination. Total workload 156 h.

Examination in Examination schedule (Yes/No):

Yes

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Number of mid-term examinations:

2

Assessment:

0-5. Written examination 70 %, assignment and presentation 30 %. Possible to raise the grade by tutorials.

Course Materials:

Lecture notes.

Prerequisites:

BH30A0001 Introduction to Nuclear Energy or equivalent skills. BH30A0201 Nuclear Reactor Design recommended.

Places for exchange-students? (Yes, number/No):

max 10

Places for Open University Students?(Yes, number/No):

max 5

BH30A0600: Radiation Protection, 3 cr

Validity: 01.08.2007 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Energy Systems

Grading: Study modules 0-5,P/F

Teachers: Elina Hujala, Juhani Hyvärinen

Note:

The course will be lectured every other year, next during the academic year 2019-2020.
In the course it is possible to take the qualification of radiation safety officer.

Lectured every other academic year (Yes, next realization year/Leave empty):

Yes, 2019-2020.

Year:

M.Sc. (Tech.) 1-2

Period:

2

Teaching Language:

Finnish

Teacher(s) in Charge:

Assistant professor, D.Sc.(Tech.) Heikki Suikkanen, M.Sc.(Tech), M.Sc. Elina Hujala

Aims:

Upon completion of the course students will be able to act as a radiation protection manager as mentioned in the radiation act for sealed sources and industrial radiography.

Contents:

Lectures on radiation protection and safety.

Teaching Methods:

Lectures 28 h, tutorials 14 h, laboratory work 4 h, assignment 21 h, preparation for the examination 8 h and written examination 3 h. Total workload 78 h.

Suitability for doctoral studies (Yes/Leave empty):

Yes

Examination in Examination schedule (Yes/No):

Yes

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

0-5. Examination 100 %. Possible to raise the grade by tutorials.

Course Materials:

Lecture notes. Radiation and Nuclear Safety Authority, Finland: Säteily- and ydinturvallisuus, where applicable, as well as the valid legislation and the related radiation safety regulations.

Prerequisites:

BH30A0001 Introduction to Nuclear Energy.

Places for exchange-students? (Yes, number/No):

No

Places for Open University Students?(Yes, number/No):

max 5

BH30A0701: Reliability Engineering, 4 cr

Validity: 01.08.2014 -
Form of study: Basic studies
Type: Course
Unit: LUT School of Energy Systems
Grading: Study modules 0-5,P/F
Teachers: Elina Hujala, Juhani Hyvärinen

Note:

The course will be lectured every other year, next during the academic year 2018-2019.

Lectured every other academic year (Yes, next realization year/Leave empty):

Yes, 2018-2019.

Year:

M.Sc. (Tech.) 1-2.

Period:

1-2

Teaching Language:

English

Teacher(s) in Charge:

D.Sc. (Tech.) Juhani Vihavainen, M.Sc. (Tech.), M.Sc. Elina Hujala.

Aims:

Upon completion of the course students will be able to calculate the reliability parameters for separate components and simple systems, formulate and solve fault and event trees for systems, and estimate the effect of human factors.

Contents:

Introduction to reliability engineering. Boolean algebra. The reliability parameters of components. The reliability engineering structure of systems, examples from different fields. Structural functions, reliability flow charts, fault trees, event trees, minimal cut sets. The reliability parameters of systems and their determination using different methods. Damage and effect analysis. The determination of parameters and trends from flaw observations. The improvement of the usage reliability of a system. Humans as a part of systems. Common mode failures and uncertainty analyses. The reliability of structures.

Teaching Methods:

Lectures 21 h, tutorials 14 h, 1st period. Lectures 21 h, tutorials 14 h, 2nd period. Preparation for the examination 31 h and written examination 3 h.
Total workload 104 h.

Suitability for doctoral studies (Yes/Leave empty):

Yes

Examination in Examination schedule (Yes/No):

Yes

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

0 - 5. Examination 100 %. Possible to raise the grade by tutorials.

Course Materials:

Rausand M. & Hoyland A: System Reliability Theory, Models, Statisticals Methods and Applications.

Prerequisites:

Recommended BM20A1401 Tilastomatematiikka I or equivalent knowledge.

Places for exchange-students? (Yes, number/No):

max 10

Places for Open University Students?(Yes, number/No):

max 5

BH40A0301: Applied Thermodynamics, 3 cr

Validity: 01.08.2016 -
Form of study: Basic studies
Type: Course
Unit: LUT School of Energy Systems
Grading: Study modules 0-5,P/F
Teachers: Ahti Jaatinen-Värri, Antti Uusitalo, Pekka Punnonen, Aki-Pekka Grönman, Jari Backman

Year:

B.Sc. (Tech.) 3

Period:

2

Teaching Language:

Finnish

Teacher(s) in Charge:

Associate professor, D.Sc. (Tech.) Antti Uusitalo

Aims:

Upon completion of the course the student: 1. Has knowledge on refrigeration machines, reciprocating engines, gasturbines, steam turbines and ORC-process 2. Understands the principles of dimensioning and optimizing the aforementioned power systems 3. Is able to evaluate the most suitable energy conversion process for different applications.

Contents:

Operational principles of reciprocating engines, Rankine-process, Brayton-process, ORC-process, refrigerant machines, steam turbines and other energy conversion processes and their typical operational parameters and applications.

Teaching Methods:

Lectures 12 h, exercises 12 h,Quizz, homeworks and independent studies. 2. period.
Total workload 78 h.

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

0-5, Quizz 42%, homework 58 %.

Course Materials:

Aittomäki, A. (toim.) Kylmätekniikka
• Eerola, O.Polttomoottorit
• Lee, J. Theory and design of steam and gas turbines
• Costante M. Invernizzi, Closed power cycles: Thermodynamic Fundementals andApplications, Lecture Notes in Energy, Springer-Verlag London 2013, ISBN978-1-4471-5139-5

Places for exchange-students? (Yes, number/No):

No

Places for Open University Students?(Yes, number/No):

max 10

BH40A0801: Turbomachinery, 4 cr

Validity: 01.08.2015 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Energy Systems

Grading: Study modules 0-5,P/F

Teachers: Jari Backman

Year:

M.Sc. (Tech.) 1

Period:

1

Teaching Language:

English

Teacher(s) in Charge:

Professor, D.Sc. (Tech.) Jari Backman

Aims:

Upon completion of the course the students will be able to 1. demonstrate knowledge about modern turbo compressors, gas turbines, as well as turbo chargers, and their design, 2. calculate the operating values of turbomachinery, 3. define and describe the most important characteristics and the optimisation of a gas turbine power plant, and 4. calculate the thrust of a jet engine.

Contents:

Turbomachinery types. Gas turbines and turbo chargers. The mechanical structure of gas turbines and turbo chargers. The operation of industrial gas turbines. The structure and operation of jet engines.

Teaching Methods:

1st period: 40 h of self-study, 14 h of learning events. Quiz tests and homework on Moodle 30 h. Written examination 20 h.
Total workload 104 h.

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

Yes

Assessment:

0 - 5. Written examination in the examination Acquarium 80%, learning events on Moodle 15%, Wikipedia article editing in turbomachinery 5%.

Course Materials:

Dixon, S. L.: Fluid Mechanics, thermodynamics of turbomachinery.
Wilson, D. G.: The design of high-efficiency turbomachinery and gas turbines.
Further material will be announced during lectures. Part of the assignments and study material on Moodle.

Prerequisites:

Fundamentals of Engineering Thermodynamics attended or equivalent course experience.

Places for exchange-students? (Yes, number/No):

15–

Places for Open University Students?(Yes, number/No):

max 5

BH40A1600: Turbomachinery in Renewable Energy, 5 cr

Validity: 01.08.2016 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Energy Systems

Grading: Study modules 0-5,P/F

Teachers: Jari Backman, Ahti Jaatinen-Värri, Aki-Pekka Grönman, Antti Uusitalo

Year:

M.Sc. (Tech.) 2

Period:

1-2

Teaching Language:

English

Teacher(s) in Charge:

Professor, D.Dc. (Tech.) Jari Backman, Associate professor, D.Sc. (Tech.) Aki Grönman, Associate professor, D.Sc. (Tech.) Ahti Jaatinen-Värri, Researcher, D.Sc. (Tech.) Antti Uusitalo

Aims:

Upon completion of the course the students are able to 1. To choose a right type of turbomachinery for each application 2. To design the main parameters of radial and axial flow turbines and radial compressors 3. To define the performance and efficiency of a turbomachine
4. To understand principles of flow theories behind design methodologies.

Contents:

Internal flows in turbomachinery, the design of an axial flow and radial flow turbines, the design of radial compressors, gas turbines, engine power plants, ORC-process and turbomachinery in it, operation of turbomachinery. The course is affiliated on the sustainability of energy systems and based on international scientific research.

Teaching Methods:

1st period, lectures + exercises 6 h, quizzes 4 h, case study 2 h, PBL tutorial 2 h, independent studies 26 h, 2nd period lectures + exercises 12 h, quizzes 6 h, case study 2 h, PBL tutorial 2 h, independent studies 68 h.
Total workload 130 h.

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

0-5, PBL 40%, case 40% and quizzes 20%.

Course Materials:

Material Notebook, Moodle course material: summary, exercises, quizzes.

Prerequisites:

BH40A0801 Turbomachinery attended or ongoing.

Places for exchange-students? (Yes, number/No):

15-

Places for Open University Students?(Yes, number/No):

Max 5

BH50A0300: Power Plant Engineering, 6 cr

Validity: 01.08.2007 -
Form of study: Basic studies
Type: Course
Unit: LUT School of Energy Systems
Grading: Study modules 0-5,P/F
Teachers: Jussi Saari, Juha Kaikko, Esa Vakkilainen

Year:

M.Sc. (Tech.) 1

Period:

1-2

Teaching Language:

Finnish

Teacher(s) in Charge:

Docent, D.Sc. (Tech.) Juha Kaikko, D.Sc. (Tech.) Jussi Saari

Aims:

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.

Contents:

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

Teaching Methods:

1st period: 18 h of lectures, 12 h of tutorials. 2nd period: Planning assignment as team work. Written examination. Independent study approximately: Planning assignment 38 h. Preparation for the examination 17 h and the examination 3 h. Studying given material 68 h.
Total workload 156 h.

Examination in Examination schedule (Yes/No):

Yes

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

0 - 5. Examination 80 %, planning assignment 20 %.

Course Materials:

Lecture notes.

Prerequisites:

BH50A0200 Introduction to Power Plant Engineering attended.

Places for exchange-students? (Yes, number/No):

No

Places for Open University Students?(Yes, number/No):

max 10

BH50A0601: Gas Technology, 4 cr

Validity: 01.08.2015 -
Form of study: Basic studies
Type: Course
Unit: LUT School of Energy Systems
Grading: Study modules 0-5,P/F
Teachers: Esa Vakkilainen, Kari Luostarinen

Note:

The course will be lectured every other year, next during the academic year 2019-2020.

Lectured every other academic year (Yes, next realization year/Leave empty):

Yes, 2019-2020

Year:

M.Sc. (Tech.) 1-2

Period:

INT. 9

Teaching Language:

Finnish

Teacher(s) in Charge:

Professor, D.Sc. (Tech.) Esa Vakkilainen, Research assistant, M.Sc. (Tech.) DI Kari Luostarinen

Aims:

Upon completion of the course the students will be able to 1. describe the utilisation possibilities and environmental effects of natural and biogas in energy production, 2. explain how the natural and biogas

systems are dimensioned, planned and operated, 3. recognise the dangers and fundamentals of safety related to the utilisation of natural and biogas, and 4. apply the laws, regulation and rules related to the utilisation of natural and biogas.

Contents:

Significance of natural- and biogas in energy supply, cases of application. Production, transportation and distribution technologies. Contents, characteristics and environmental effects of natural- and biogas. Combustion, boilers and burners. Combined heat and power production
with natural gas. Direct utilisation of natural- and biogas in heating and drying. Operational safety, rules and regulations.

Teaching Methods:

Intensive week 9: 10 h of lectures. 3rd period: 10 h of self-study exercises. Written examination. Self-study: Self-study exercise10 h, preparation for the examination 12 h and written examination 3 h. Material study 69 h.
Total workload 104 h.

Examination in Examination schedule (Yes/No):

Yes

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

0 - 5. Examination 80 %, exercises 20 %.

Course Materials:

Lecture material.
Riikonen, Arto: Maakaasun ja nestekaasun koostumus ja ominaisuudet (M1), Gasum, 1993.
Riikonen, Arto: Kaasun käyttökohteiden putkistot sekä käyttölaitteiden sijoittaminen ja varustelu, Gasum (M5), 1998.
Riikonen, Arto: Maakaasun ja nestekaasun palaminen, Gasum (M6), 1997.
Riikonen, Arto: Maakaasun jakelu- ja käyttöputkisojen mitoitus (M18), Gasum, 1997.
Maakaasukäsikirja, Finnish Gas Association, 2010.
Moodle.

Places for exchange-students? (Yes, number/No):

No

Places for Open University Students?(Yes, number/No):

max 10

BH50A1300: Maintenance Management, 4 cr

Validity: 01.08.2007 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Energy Systems

Grading: Study modules 0-5,P/F

Teachers: Esa Vakkilainen, Juha Kaikko

Year:

M.Sc. (Tech.) 2

Period:

1-2

Teaching Language:

English

Teacher(s) in Charge:

Docent, D.Sc. (Tech.) Juha Kaikko, Professor, D.Sc. (Tech.) Esa Vakkilainen

Aims:

Upon completion of the course the student willbe 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.

Contents:

Terminology. Engineering design: failure models, reliability and availability. Maintenance strategies. Maintenance assessment and control. Maintenance in power industry.

Teaching Methods:

1st period: 12 h of lectures and case exercises. 2nd period: 6 h of lectures and case exercises. Written assignment. Written examination. Independent study approximately: Written assignment 32 h. Preparation for the examination 14 h and the examination 3 h. Studying given material 37 h.
Total workload 104 h.

Examination in Examination schedule (Yes/No):

Yes

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

0 - 5. Examination 70 %,written assignment 30 %.

Course Materials:

Crespo Márquez, A.: The Maintenance Management Framework: Models and Methods for Complex Systems Maintenance, Springer-Verlag, 2007.
Dhillon, B.S.: Engineering Maintenance: A ModernApproach, CRC Press, 2002.
Lecture notes.

Places for exchange-students? (Yes, number/No):

max 5

Places for Open University Students?(Yes, number/No):

max 5

BH50A1701: District Heating, 4 cr

Validity: 01.08.2016 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Energy Systems

Grading: Study modules 0-5,P/F

Teachers: Esa Vakkilainen, Juha Kaikko

Year:

M.Sc. (Tech.) 1

Period:

3-4

Teaching Language:

English

Teacher(s) in Charge:

Professor, D.Sc. (Tech.) Esa Vakkilainen, D.Sc. (Tech.) Jussi Saari

Aims:

Upon completion of the course the student will be able to 1. describe the basics of district heating in the world and in Finland, 2. explain the technical solutions of generating and delivering district heating at a detailed level, do engineering design to 3. dimension heat output and annual thermal energy necessary for various heating applications, 4. dimension the district heating system and its components, 5. understand and calculate various losses, 6. evaluate the basic design and use of district heating networks and heat production.

Contents:

The formation of energy demand in buildings and the consumption variation. Consumer devices, connections and energy measurement. Abitility to design piping as well as network planning and control. Production of district heating, district heating plants and heating power plants. Cost and tariffs for district heating.

Teaching Methods:

3rd period: 10 h of lectures. Independent study 14 h. Independent calculations and online tasks 20 h. 4th period: Written assignment 48 h. Evaluating assignments 12 h.
Total workload 104 h.

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

0 - 5. Written assignment 60 %, independent calculations and online tasks 40 %.

Course Materials:

Frederiksen, Svend and Werner, Sven: District Heating and Cooling, Studentlitteratur, 2014.
Koskelainen, Lasse et al.: Kaukolämmön käsikirja, Energiateollisuus, 2006.
Lecture notes.

Places for exchange-students? (Yes, number/No):

Yes, 5

Places for Open University Students?(Yes, number/No):

Yes, 5

BH50A1800: Fundamentals of Energy Systems Planning, 6 cr

Validity: 01.08.2011 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Energy Systems

Grading: Study modules 0-5,P/F

Teachers: Esa Vakkilainen

Year:

M.Sc. (Tech.) 2

Period:

1-2

Teaching Language:

Finnish

Teacher(s) in Charge:

Professor, D.Sc. (Tech.) Esa Vakkilainen

Aims:

Upon completion of the course the students will be able to 1. use the “Systems Engineering” method for the definition of initial data in energy system projects, 2. describe the implementation phases of the energy system projects, and 3. demonstrate practical skills for the planning, management and implementation of energy system projects and for the estimation of the systems’ environmental impacts.

Contents:

Students develop their own system product (steam, wind or solar power plant) through team and project work. During the course, students apply the “Systems Engineering” method, which consists of the following: the definition of the requirements for the product, testing, validation, the assessment and comparison of alternatives, the management and specification of subentities, risk assessment, reliability analysis, the optimisation and documentation of implementation. The student assumes one of the roles for the team: project manager, technical engineer, environmental engineer, cost engineer. Project planning and execution. Cost analysis. Estimation of environmental impact. The use of computer software as a planning aid.

Teaching Methods:

1st period: 10 h of lectures and planning tutorials. 2nd period: 8 h of lectures and planning tutorials and 2+2 h of seminar. Independent study approximately: Written assignment 80 h. Presentation preparation 14 h. Studying given material 40 h. The planning assignment is carried out in a team.
Total workload 156 h.

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

0 - 5. Written report of the planning assignment 70 %, oral presentation 30 %.

Course Materials:

Lecture notes.

Prerequisites:

Recommended: BH50A0200 Introduction to Power Plant Engineering and BH50A0800 Steam Boilers.

Places for exchange-students? (Yes, number/No):

No

Places for Open University Students?(Yes, number/No):

max 5

BH50A1900: Planning of Energy Systems, 4 cr

Validity: 01.08.2012 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Energy Systems

Grading: Study modules 0-5,P/F

Teachers: Esa Vakkilainen

Year:

M.Sc. (Tech.) 2

Period:

3-4

Teaching Language:

Finnish

Teacher(s) in Charge:

Professor, D.Sc. (Tech.) Esa Vakkilainen

Aims:

Upon completion of the course the students will be able to 1. describe energy system projects including the related technical dimensioning, the power plant project execution, the siting of the power plantand the minimization of the environmental impact, 2. participate in the evaluation of environmental impacts, licensing and decision making in energy system projects, 3. optimize the power plant and its components, and 4. compare factors affecting the power plant economics.

Contents:

Students continue to develop their own system product (steam, wind or solar power plant) through team and project work. During the course, students apply the “Systems Engineering” method, which consists of the following: the definition of the requirements for the product, testing, validation, the assessment and comparison of alternatives, the management and specification of subentities, risk assessment, reliability analysis, the optimisation and documentation of implementation. The student assumes one of the roles for the team: e.g. project manager, technical engineer, environmental engineer, cost engineer. Project planning and execution. Cost analysis. Estimation of environmental impact. Modelling of the power plant for the planning. The components of power plant. The dimensioning and optimisation of components. Fluid dynamic dimensioning. Thermal engineering simulation. The use of computer software as a planning aid. Documentation and public presentation of results.

Teaching Methods:

3rd period: 10 h of lectures and planning tutorials. 4th period: 8 h of lectures and planning tutorials and 2+2 h of seminar. Independent study approximately: Written assignment 50 h. Presentation preparation 14 h. Studying given material 18 h. The planning assignment is carried out in a team.
Total workload 104 h.

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

0 - 5. Written report of the planning assignment 70 %, oral presentation 30 %.

Course Materials:

Lecture notes.

Prerequisites:

BH50A1800 Energiajärjestelmien suunnittelun perusteet.

Places for exchange-students? (Yes, number/No):

No

Places for Open University Students?(Yes, number/No):

max 5

BH50A2200: Bioenergy and Energy Use in the Forest Industry, 6 cr

Validity: 01.01.2018 -
Form of study: Basic studies
Type: Course
Unit: LUT School of Energy Systems
Grading: Study modules 0-5,P/F

Year:

M.Sc. (Tech.) 2

Period:

3-4

Teaching Language:

English

Teacher(s) in Charge:

Professor, D.Sc. (Tech.) Esa Vakkilainen

Aims:

Upon completion of the course the students will be able to recognize the importance of forest industry to economy, can describe processes used, understands the role of biomass, recycling and bioenergy, can evaluate and understand the energy use of basic processes, explain the importance of energy procurement for forest industry mill. Understands the factors that determine effective energy use and production. Can draw the energy procurement plan for a forest industry mill.

Contents:

Principles of producing chemical kraft pulp and process energy use. Importance of bioenergy and biofuels in forest industry. Project planning and execution. Engineering design: Students develop energy procurement plan for given forest industry mill through team and project work. Modelling of the power plant for the planning. Energy use for plant subprocesses. The dimensioning and optimisation of energy delivery. Thermal engineering simulation. Compare factors affecting the power plant economics. Documentation of results.

Teaching Methods:

3rd period: 10 h of lectures and planning tutorials. 4th period: 8 h of planning tutorials. Assignment. Exam. Independent study approximately: Written assignment 80 h. Studying given material 52 h. Exam 3 h.
Total workload 156 h.

Examination in Examination schedule (Yes/No):

Yes

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

0 - 5. Examination 70%, written report of the engineering design assignment 30 %.

Course Materials:

Lecture notes.

Places for exchange-students? (Yes, number/No):

max 5

Places for Open University Students?(Yes, number/No):

max 5

KaSOIbm: International Business and Management, 21 - 35 cr

Validity: 01.08.2016 -

Form of study:

Type: Study module

Unit: LUT School of Business and Management

Grading: Study modules 0-5,P/F

Note:
This minor is not allowed for the students of Business Administration.
The number of students attending to the courses in the minor can be limited. In these cases the priority is given to the students who have these courses in their compulsory studies.

Aims:
Minor in International Business and Management aims to provide basic knowledge on marketing and sales management as well as their idiosyncracies that arise from doing international business. After completion of this minor, the students are able to analyze, plan and develop the processes of marketing and sales in international business context. In addition, they understand the cultural issues that arise from international operating environment. The students possess good skills in communication, cooperation and project management.

Elective courses 21-24 cr

A370A0401: Case-Course of Business, 6 cr

Validity: 01.08.2012 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Business and Management

Grading: Study modules 0-5,P/F

Teachers: Jukka-Pekka Bergman

Year:

B.Sc. (Econ. & Bus. Adm.) 3

Period:

1-2, 3-4

Teaching Language:

English

Teacher(s) in Charge:

Post-Doctoral Researcher, D.Sc. (Tech.), Dos. Jukka-Pekka Bergman

Aims:

The aim of the course is to familiarize students with the case-writing through the self-oriented independent team work by making an exersice of a *business analysis of a real case firm*. The students are able to evaluate and describe firm's business practices, markets, and explain their development using the frameworks she or he has learned at previous courses. The student is able to construct a well-written description of a case-firm and its business environment as well as provide concluding suggestions for the development targets for the firm using different empirical materials collected during the exercise. In addition, students train to organize and study the group work by themselves being collectively/as a group responsible for the case process and results.

Contents:

Strategy analysis. Case study methodology. Case-writing.

Teaching Methods:

Lectures 4 h, selection of case-company and collection of data 40 h, reading of the literature needed in the analysis and description of the case 40 h, case-writing in English (international groups) or Finnish 76 h and possible final seminar (4 hours). Total workload for student 160 h.

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

Grade 0-5, evaluation 0–100 p. Literary group assignment 100%.

Course Materials:

Lecture slides.

Prerequisites:

B. Sc. (Econ. & Bus. Adm.) 2 studies

Places for exchange-students? (Yes, number/No):

15–

Places for Open University Students?(Yes, number/No):

max 10

Description and DL of the company assignment:

Exercise is a real-life business case that can/recommended to be a project for a company.

A380A0000: Cross-Cultural Issues in International Business, 6 cr

Validity: 01.08.2011 -
Form of study: Basic studies
Type: Course
Unit: LUT School of Business and Management
Grading: Study modules 0-5,P/F
Teachers: Igor Laine

Year:

B.Sc. (Econ. & Bus. Adm.) 2

Period:

3

LUT Winter School time:

Yes

Teaching Language:

English

Teacher(s) in Charge:

Post-doctoral researcher, D.Sc. (Econ. and Bus. Adm.) Igor Laine

Aims:

The goal of the course is to give an understanding of how the cultural environment affects management in international business, and advance students' global mindset by giving conceptual tools to increase their intercultural competence. After completing the course the students will be able to:
1. define and categorize culture
2. explain cultural orientations towards time, space and context
3. analyze and compare national cultures according to Hofstede's, Trompenaars' and GLOBE cultural dimensions
4. reflect upon the relationship between culture, organizations and management - evaluate the effects of the cultural environment on international marketing strategies
5. examine the sources of cultural conflicts in international organizations
6. identify the role of cultural factors in managing and leading international teams
7. apply studied theories and ideas to business situation

The general aim of the course is to improve following personal skills and abilities of the students:
- recognizing cultural differences
- interacting effectively with people from other cultures
- working in groups and international teams

Contents:

Concept and levels of culture, dimensions of culture in business (Hall, Hofstede, Trompenaars and GLOBE); The effect of culture on leadership and management in international business; The limits of globalization from the cultural perspective; Cross-cultural issues in virtual teams; Standardization and adaptation in international marketing; Country cases of cultural differences (term paper reports)

Teaching Methods:

15 hours of lectures, case study workshop (2 hours) and term paper presentation seminar (4 hours). Preparation for lectures 12 h. Writing of term paper, preparation for case study and term paper presentations, 63 h. Written exam and preparation for exam 65 h. Total workload for student 160 h.

Examination in Examination schedule (Yes/No):

Yes

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

Yes

Assessment:

Grade 0-5, evaluation 0-100 points, written exam 60 %, term paper 25 %, peer group evaluation report 5 %; case assignment 10 %, all assignments must be passed to obtain a final grade.

Course Materials:

1.Browaeys & Price: Understanding Cross-Cultural Management (3rd ed), Pearson, 2015
2.Lecture slides
3.Additional material distributed in class and via Moodle

Prerequisites:

Basic course in management or marketing

Places for exchange-students? (Yes, number/No):

15–

Places for Open University Students?(Yes, number/No):

max 10

A380A0131: Business Relationships in International Value Networks, 6 cr

Validity: 01.01.2018 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Business and Management

Grading: Study modules 0-5,P/F

Teachers: Terhi Tuominen, Anni-Kaisa Kähkönen

Note:

If student has taken the course of A380A0130 Kansainväliset liikesuhteet arvoverkostoissa, the student is not able to participate to this course.

Year:

B.Sc. (Econ. & Bus. Adm.) 3

Period:

1

Teaching Language:

English

Teacher(s) in Charge:

Associate Professor, D.Sc. (Econ. & Bus. Adm.) Anni-Kaisa Kähkönen
Post-Doctoral Researcher, D.Sc. (Econ. & Bus. Adm.) Terhi Tuominen

Aims:

The aim of the course is to familiarize students with different business relationships in value networks, with the management of relationships and networks, and the characteristics of international business 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
- recognize and understand the characteristics of value networks
- define supplier and customer relationships
- participate to the development of relationships.

Contents:

The concepts and theories of collaboration and networking, characteristics of value networks, the benefits and challenges of collaboration, managing of collaboration and networks, vertical and horizontal collaboration, the management of supplier relationships and customer relationships.

Teaching Methods:

Online course, student driven content creation anddiscussion. Reading assignments and writing of essays 40 h. Case assignmentincluding written reports, 60 h, in small groups. Independent Moodle exam and preparation for exam 60 h, 1stperiod. Total workload for student 160 h.

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

Yes

Examination in Exam (Yes/No):

No

Assessment:

Grade 0-5, evaluation 0-100 points. Exam 40 %, case assignment 40 %, essays 20 %, all assignments must be passed to obtain final grade.

Course Materials:

1. Selection of journal articles, 2. Assigned readings

Prerequisites:

B.Sc. (Econ. & Bus. Adm.) General studies

Places for exchange-students? (Yes, number/No):

15–

Places for Open University Students?(Yes, number/No):

15–

A380A0201: Sales and Marketing Communication, 6 cr

Validity: 01.01.2018 -
Form of study: Basic studies
Type: Course
Unit: LUT School of Business and Management
Grading: Study modules 0-5,P/F
Teachers: Anssi Tarkiainen, Tommi Rissanen

Note:

Replaces the course A380A0200 Promotion and Sales Management 6 cr

Year:

B.Sc. (Econ. & Bus. Adm.) 3

Period:

2

Teaching Language:

English

Teacher(s) in Charge:

Associate Professor, D.Sc. (Econ. & Bus. Adm.) Anssi Tarkiainen
Doctoral Student, M.Sc. (Econ. & Bus. Adm.) Tommi Rissanen

Aims:

After completing the course the student will understand changes in the field of commerce, including buying behavior, marketing communication (MC) and sales management (SM). Student is able to create and design marketing and sales funnel that applies new, more productive technologies. This course will pay special emphasis on understanding the linkages between marketing communication and sales, and the challenges in their integrated management.
The learning outcomes of the course are the following:
- to understand the evolution of buying behavior, marketing and sales in the era of digital technologies
- to understand the role of MC and SM in marketing strategy
- to assess the usability of different forms of communication with regard to buyer behavior
- to be able to design, implement and manage marketing communication and sales as part of the marketing process
- to assess the challenges of integrating MC and sales strategies, and combining traditional tools with new technologies
- to evaluate the effectiveness of MC and sales in the changing business environment.

Contents:

Core contents:
- The evolution of buying behavior, marketing and sales in the era of digital technologies.
- The role of marketing communication (MC) and sales in marketing strategy.
- The role of buyer behavior and its effects on the nature of communication (mass vs interactive /personal).
- MC and sales process, message and media strategy.
- Strategic planning process of MC and sales; challenges of integrating MC and sales management strategies.
Additional knowledge:
- Sustainability in MC context.
Special knowledge:
- Digitalization of MC and sales.

Teaching Methods:

Combined lectures and exercises 28 h 2. period. Preparation for exercises 63 h (including written work) and preparation for the exam 71h. Written exam.
Total workload for student 160 h.

Examination in Exam (Yes/No):

Yes

Assessment:

Final grade 0-5, evaluation 0-100 points.Exercises 40 points, written exam 60 points.

Course Materials:

Lectures and selected articles.

Prerequisites:

A130A0250 Kansainvälisen markkinoinnin perusteet (or basic course in marketing).

Places for exchange-students? (Yes, number/No):

Yes, 15-

Places for Open University Students?(Yes, number/No):

Max 5

A380A6050: Introduction to International Business and Planning, 3 cr

Validity: 01.08.2011 -
Form of study: Basic studies
Type: Course
Unit: LUT School of Business and Management
Grading: Study modules 0-5,P/F
Teachers: Seyedsina Mortazavibabaheidari, Toivo Äijö

Year:

B.Sc. (Econ. & Bus. Adm.) 3

Period:

1 (intensive)

Teaching Language:

English

Teacher(s) in Charge:

D.Sc. (Econ.) Toivo S. Äijö, Top Trainers Group
Professor, D.Sc. (Econ. & Bus. Adm.) Sami Saarenketo
Junior Researcher Sina Mortazavi

Aims:

To familiarize the students with the fundamentals of international business in general and strategic planning for international business in particular. To provide the students with the analytical skills required for critical evaluation of actual international business strategies.

Contents:

- The changes in the international Business environment and their effect on strategic planning.
- Theories of international trade and business.
- The institutions of international trade and business.
- The essence of competitive strategy.
- Levels of strategic planning.
- International expansion strategy.
- Supporting research.
- International marketing strategy: entry modes, targeting, product, service, pricing, promotion, sales

and CRM.
- International functional strategies.
- Case studies.

Teaching Methods:

Intensive course during 1. period. 25 hours of lectures, interactive analyses, case exercises and assignments, carried out by the student, 55 hours, total course 80 h. Written examination.

Examination in Examination schedule (Yes/No):

Yes

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

Graded 0-5 on the basis of case studies and class participation 20 % and written examination 80 %, evaluation 0 – 100 points.
50 % class attendance and participation required.

Course Materials:

The study material will be distributed at the beginning of the lectures.

Prerequisites:

Basic course in marketing

Places for exchange-students? (Yes, number/No):

max 5

Places for Open University Students?(Yes, number/No):

max 10

CS10A0262: International Business Essentials, 6 cr

Validity: 01.08.2017 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Business and Management

Grading: Study modules 0-5,P/F

Teachers: Igor Laine, Asta Salmi, Juha Väätänen

Note:

This course is available only to students of candidate programs of LUT School of Business and Management.
Interchangeable with CS10A0261 Managing International Business.

Year:

B.Sc. (Econ. & Bus. Adm.)or B.Sc. (Tech.) 2, 3

Period:

2

Teaching Language:

English

Teacher(s) in Charge:

Post-doctoral researcher, D.Sc. (Econ. and Bus. Adm.) Igor Laine
Professor, D.Sc. (Econ. and Bus. Adm.) Asta Salmi
Professor, D.Sc. (Tech.) Juha Väätänen

Aims:

After successful completion of the course, students should be able to: 1. describe the key concepts in international business, 2. explain how international business differs from domestic business, 3. identify major participants in international business, 4. describe, discuss applicability and apply various internationalization theories, 5. describe strategy in international business, 6. describe various principles of market selection, 7. examine advantages and disadvantages of different entry modes, 8. discuss major features of global marketing program, 9. recognize the characteristics of international business relationships.

Contents:

International business theories. International competitiveness. Regional economic integration. International business strategy. Market selection and entry modes in international business. Global marketing. International business relationships and networking.

Teaching Methods:

15 h of lectures, 14 h preparation for lectures, 20 h assignments, 40 h written report, 3 h peer group evaluation, 14 h course literature and self-study, 50 h exam preparation. Total 156 h.

Examination in Examination schedule (Yes/No):

Yes

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

0 - 5. Exam 40 %, written report 35 %, peer group evaluation 5%, home-work assignments 20%. Each of the components has to be passed acceptably.

Course Materials:

Cavusgil S.T., Knight G., Reisenberger J., 2017, International Business: The New Realities (4th edition), Harlow, UK: Pearson Education Ltd. Additional materials will be announced on lectures

Limitation for students? (Yes, number, priorities/Leave empty):

Yes, 75

Places for exchange-students? (Yes, number/No):

15–

Places for Open University Students?(Yes, number/No):

15–

SaDREE: Renewable Energy and Energy Efficiency, 20 cr

Validity: 01.08.2015 -

Form of study:

Type: Study module

Unit: LUT School of Energy Systems

Grading: Study modules 0-5,P/F

Aims:

The student completing the minor studies in renewable energy and energy efficiency is able to describe renewable energy technologies and recognise issues related to renewable energy production and economics. Moreover, the student is able to describe and explain renewable energy conversion processes and is capable of respective investment and system planning. Additionally, the student is able to estimate the overall energy efficiency of the energy conversion system.

Choose a min. of 20 ECTS cr. BL10A8400SS is a LUT Summer School course.

BL10A8400SS: Solar Economy and Smart Grids, 3 cr

Validity: 01.06.2014 -
Form of study: Basic studies
Type: Course
Unit: LUT School of Energy Systems
Grading: Study modules 0-5,P/F
Teachers: Olli Pyrhönen, Satu Viljainen, Jarmo Partanen, Christian Breyer

Year:

M.Sc. (Tech.) 1–2

Period:

INT. Summer School

LUT Summer School time:

6. – 10.8.2018

Teaching Language:

English

Teacher(s) in Charge:

Professor, D.Sc. (Tech.) Christian Breyer

Aims:

After having passed this course the student is able to:
- understand the basic processes of solar economy and Smart Grids
- recognize the key properties of global climate challenges, solar economy, electricity market models, wind and solar power technologies, energy storage technologies and smart grid concept
- recognize the most important aspects, chances and challenges of transformation from existing energy systems to sustainable energy systems.

Contents:

During the course the student will become familiar with the properties and application areas of:
- Climate change
- Solar economy
- Wind power technology
- Solar power technology
- Energy Storage Technologies
- New electricity market
- Demand response
- Smart Grid concept.

Teaching Methods:

- Introductory lectures and exercises 24 h
- Team work and a limited project work 20 h
- Presentations of the results of the team work/ project work 8 h
- Independent work is needed 26 h.

Total workload 78 h.

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

Final grade 0 –5, project work/presentation

Course Materials:

Lecture notes and other materials distributed during the course by email.

Prerequisites:

Previous studies either in electrical engineering, environmental engineering or energy engineering are recommended.

Places for exchange-students? (Yes, number/No):

15–

Places for Open University Students?(Yes, number/No):

max 5

BL20A1300: Energy Resources, 6 cr

Validity: 01.08.2014 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Energy Systems

Grading: Study modules 0-5,P/F

Teachers: Christian Breyer, Michael Child

Year:

M.Sc. (Tech.) 1

Period:

1-2

Teaching Language:

English

Teacher(s) in Charge:

Professor, D.Sc. (Tech.) Christian Breyer

Aims:

Upon completion of the course the student will be able to: 1. Identify the constraints and potentials of all relevant energy sources 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 transformation.

Contents:

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

Teaching Methods:

Lectures 14 h, exercises 14 h, 1st period. Lectures 14 h,exercises 14 h, 2nd period. Examination 3h. Independent study 97 h.
Total workload 156 h.

Examination in Examination schedule (Yes/No):

Yes

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

0-5, examination 100%.

Course Materials:

Material handed out in class and made available on Moodle.

Places for exchange-students? (Yes, number/No):

15–

Places for Open University Students?(Yes, number/No):

max 5

BL20A1400: Renewable Energy Technology, 6 cr

Validity: 01.08.2015 -
Form of study: Basic studies
Type: Course
Unit: LUT School of Energy Systems
Grading: Study modules 0-5,P/F
Teachers: Michael Child, Christian Breyer

Year:

M.Sc. (Tech.) 1

Period:

3-4

Teaching Language:

English

Teacher(s) in Charge:

Professor, D.Sc. (Tech.) Christian Breyer

Aims:

Upon completion of the course the student will be able to: 1. Identify the major renewable energy (RE) conversion technologies, mainly converting resources to electricity. 2. Describe the major characteristics of the technologies, in particular applications, efficiency, economics, industrial scale and future prospects. 3. Analyse the need for storage technologies and their different fields of application based on their key technical and economic features.

Contents:

The course is focused on the conversion of the resources to electricity. The RE technologies discussed in the course are: wind turbines, solar photovoltaics, solar thermal electricity generation and hydro powerplants. The storage technologies covered comprise a general overview and in particular include battery storage, pumped hydro storage and power-to-gas technologies. All technologies are classified with respect to their applications, efficiency, maturity, economics, industrial scaling and expected relevance for the ongoing energy transformation.

Teaching Methods:

3rd period lectures 14 h, exercises 14 h. 4thperiod lectures 14 h, exercises 14 h, examination 3 h. Independent study 97 h.
Total workload 156 h.

Suitability for doctoral studies (Yes/Leave empty):

Yes

Examination in Examination schedule (Yes/No):

Yes

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

0-5, examination 100 %

Course Materials:

Material handed out in class and made available on Moodle.

Places for exchange-students? (Yes, number/No):

15–

Places for Open University Students?(Yes, number/No):

max 5

BL20A1500: Energy Scenarios, 6 cr

Validity: 01.08.2015 -
Form of study: Basic studies
Type: Course
Unit: LUT School of Energy Systems
Grading: Study modules 0-5,P/F
Teachers: Michael Child, Christian Breyer

Year:

M.Sc. (Tech.) 2

Period:

1-2

Teaching Language:

English

Teacher(s) in Charge:

Professor, D.Sc. (Tech.) Christian Breyer

Aims:

Upon completion of the course the student will be able to: 1. Describe the sustainability requirements of future energy systems as the major guard rail for the energy transformation. 2. Analyse energy transformation scenarios and identify the key technologies and setups for sustainable energy progress. 3. Describe the energy transformation in all sectors, the major technologies, the required transformation period and entire system cost optimization. 4. Describe the special role of power technologies for the energy transformation. 5. Recognize the difference between standard levelized cost ofenergy and total societal cost of energy.

Contents:

The course comprises the key elements of energy scenarios: demand, supply, cost, constraints. Energy demand is an aggregate of power, heat, cooling, mobility, agriculture and industrial energy needs. The demand has tobe matched with supply of energy fulfilling sustainability criteria, safety requirements and societal acceptance for the least cost. A complete set of demand curves, technical characteristics of all major technologies, current and projected technology costs and emission factors are taken into account for sustainable energy transformation pathway formulation. The special relevance ofwind energy and solar photovoltaics, the increasing relevance of power technologies,the role of storage technologies and the necessity of societal cost of energy are discussed in detail. Real scenarios for Finland, Europe and the World used as references.

Teaching Methods:

1st period lectures 14 h, exercises 14 h. 2ndperiod lectures 14 h, exercises 14 h, presentation/oral examination 1 h. Independent study 99 h. Total workload 156 h.

Suitability for doctoral studies (Yes/Leave empty):

Yes

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

0-5, presentation/oral examination 100 %

Course Materials:

Material handed out in class and made available on Moodle.

Prerequisites:

BL20A1300 Energy Resources and BL20A1400 Renewable Energy Technology (at least one of the two courses)

Places for exchange-students? (Yes, number/No):

max 15

Places for Open University Students?(Yes, number/No):

max 5

BL40A2301: Energy Efficiency, 6 cr

Validity: 01.08.2013 -

Form of study: Basic studies

Type: Course

Unit: LUT School of Energy Systems

Grading: Study modules 0-5,P/F

Teachers: Tero Ahonen, Tero Kaipia, Jero Ahola, Antti Kosonen, Lasse Laurila

Note:

The course is suitable for distance learning.

Year:

M.Sc. (Tech.) 1

Period:

4

Teaching Language:

English

Teacher(s) in Charge:

Professor, D.Sc (Tech.) Jero Ahola

Aims:

Upon completion of the course the student will be able to: 1. determine actions for the energy efficiency of the energy conversion process, 2. estimate the overall energy efficiency of the energy conversion system, 3. identify applications of electric energy usage and apply
methods that can be used to improve the energy efficiency.

Contents:

The course provides the student with an introduction to the significance and development potential of energy efficiency in energy production, transmission, distribution and end use. The focus is on electric energy and systems approach. The lecture topics are the efficiency of
energy production processes, the efficiency of electricity transmission and distribution and the efficiency of energy end use. The course is arranged as a series of lectures delivered by experts. The lecture topics may vary from year to year.

Teaching Methods:

Lectures 12 h, individual home works 141 h, examination 3 h. The course is suitable for distance learning. Total workload 156 h.

Suitability for doctoral studies (Yes/Leave empty):

Yes

Examination in Examination schedule (Yes/No):

No

Examination in Moodle (Yes/No):

Yes

Examination in Exam (Yes/No):

No

Assessment:

0-5, examination 100%. In addition, 70 % of individual assignments have to be passed. It is also possible to receive additional points to the exam based on the individual assignments.

Course Materials:

Lecture material in Moodle.

Places for exchange-students? (Yes, number/No):

15–

Places for Open University Students?(Yes, number/No):

max 15

BH61A0600: Bioenergy, 3 cr

Validity: 01.08.2011 -
Form of study: Basic studies
Type: Course
Unit: LUT School of Energy Systems
Grading: Study modules 0-5,P/F
Teachers: Tapio Ranta

Year:

M.Sc. (Tech.) 1

Period:

1

Teaching Language:

English

Teacher(s) in Charge:

Tapio Ranta, D.Sc. (Tech.), Professor

Aims:

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.

Contents:

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.

Teaching Methods:

1st period: 12 h of lectures. Written examination 3 h. 63 h of self-study.
Total workload 78 h.

Examination in Examination schedule (Yes/No):

Yes

Examination in Moodle (Yes/No):

No

Examination in Exam (Yes/No):

No

Assessment:

0 - 5. Examination 100 %.

Course Materials:

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

Places for exchange-students? (Yes, number/No):

15–

Places for Open University Students?(Yes, number/No):

max 5