Master in green energy technology

Study Plan for Master in Green Energy Technology (120 ECTS) (2024–2026)

Facts about the program

ECTS Credits:
120

Study duration:
2 years

Teaching language:
English

Campus:
Østfold University College, campus Fredrikstad.

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Study information

The Master in Green Energy Technology focuses on a sustainable and environmentally friendly approach to energy technology.

The students will acquire knowledge and skills related to renewable energy sources and advanced materials needed to understand the principles of energy generation and storage. The students will also acquire knowledge related to how such energy sources and materials can be interconnected through smart grid and micro grid systems. They will learn how the concept of circular economy can be adapted to energy technology to achieve optimized resource efficiency. Throughout, project work in interdisciplinary groups provides collaboration skills and a better understanding of how each part of an energy system interact together to form an integrated unit.

After successfully completed four semesters, a Master in Green Energy Technology has the competence needed to implement appropriate innovation processes combined with specialized technological knowledge and skills in energy technology and thereby contribute to the development of a more sustainable society.

What do you learn?

Degree/title obtained

Students who complete and pass the programme are awarded the degree of Master in Green Energy Technology

Learning outcomes

A candidate who has completed his or her qualification should have the following learning outcomes defined in the terms of knowledge, skills and general competence:

Knowledge:

For the profile Smart Energy Technology the Candidate:

has specialized insight into power systems, smart-grids and micro-grids and advanced knowledge regarding materials for energy technology, resource shortages and renewable energy sources

has advanced knowledge of experimental and theoretical methods and modelling utilized in green energy technology for power systems, smart-grids and micro-grids, and is able to utilize

his/her advanced and specialized knowledge in new areas.

For the profile Materials for Energy Technology the Candidate:

- has specialized insight into materials for green energy technology and advanced knowledge regarding renewable energy sources, power systems, smart-grids and micro-grids and challenges related to resource shortages
- has advanced knowledge of experimental and theoretical methods and modelling utilized in materials for green energy technology, and is able to utilize his/her advanced and specialized knowledge in new areas.

For both profiles the Candidate:

- is able to understand how societal, political and economic assumptions affect strategies and pathways chosen within debates and decisions regarding future energy technology
- is able to analyze scientific problems within energy technology, and relate this to the history of energy technology and its place in societal debates and strategies, both nationally and internationall.

Skills
The Candidate:

- is able to critically analyze different sources of information and research methods, and use them to structure and develop academic arguments
- is able to analyze and apply different theories within energy technology, and utilize experimental and theoretical methods and modelling within energy technology, and can work independently with practical and theoretical problem solving
- can handle multiple analytical tools to influence politics and strategies and be a contributor in innovation processes, development and decision making related to future energy technology
- is able to independently conduct a defined research or development project under supervision, in agreement with existing ethical norms, and is able to analyze ethical

problems related to green energy technology.

General Competence
The Candidate:

- is able to utilize his/her knowledge and skills within new areas to accomplish advanced tasks and projects, and is able to find relevant scientific literature for new topics within energy technology
- is able to discuss and give oral and written presentations regarding research, and development projects related to energy technology
- is able to collaborate and contribute to team projects, and actively participate in innovation processes related to energy technology.

Admission

The minimum requirements for admission is one of the following:

1) Relevant bachelor's degree in engineering or equivalent education of at least 180 ECTS
or
2) Relevant natural science bachelor's degree or equivalent education of at least 180 ECTS

To be admitted, the applicant must have an average grade value from the qualifying education of at least 25 (according to ECTS standards).

Proof of English proficiency is also required.

For the profile choice with specialisation in Smart Energy Technology, relevant degrees must be within the fields of electrical engineering, energy technology, electric power systems, computer science, or equivalent.

For the profile choice with specialization in Materials for Energy Technology, relevant degrees must be within the fields of energy technology, materials science, chemistry, chemical

engineering, physics, mechanical engineering, civil engineering, or equivalent.

In addition, all applicants must pass both a written essay and an online entrance test. Applicants from countries outside the EU/EEA must submit proof of funding when submitting their application.

Structure and content

The structure and content of the programme

The Master in Green Energy Technology is a full-time study program for 2 years (4 semesters). The master program consists of a combination of compulsory and elective courses.
The student will choose a main disciplinary profile, either Smart Energy Technology or Materials for Energy Technology, when applying to the master program.
The first three semesters provides the students with understanding, knowledge and skills related to societal issues such as policies and innovation processes, available resources and the use and development of materials and systems for improved energy use. In combination with knowledge and skills related to the logics of scientific work and thinking, this prepares the students for the fourth and final semester, culminating in a Master Thesis on the topic of the chosen specialization.

The first semester is fixed for all students, with four compulsory courses. These will provide the students with a general interdisciplinary background within green energy technology, teach the students to work in interdisciplinary groups, learn them scientific methods, and how to present their work both orally and as a written report.

In the second semester, there are 15 ECTS points (5 + 10) compulsory coursework. In addition to the compulsory part of the second semester, each student choose one of the two specialization profiles as a rule based on their prior bachelor level education, which provided the fulfillment of the admission requirement. Both profiles is constituted by two courses, counting totally 15 ECTS points (5+10).

To enter the Smart Energy Technology profile, students are expected to possess basic knowledge and skills related to electrical circuits. The Smart Energy Technology profile focuses on the integration of renewable energy sources in power systems, in addition to the concept of micro grids, including modelling and simulations of such.

The Materials for Energy Technology profile focuses on the use and understanding of advanced materials, and how such materials can provide development opportunities related to provident and sustainable technology applications for future energy use efficiency.

The third semester consist mainly of elective courses. Please note that the portfolio of elective courses may change. The execution of elective courses depends on the amount of students enrolled in the course, and will be evaluated by the master GET program management. There is also a 10 ECTS compulsory course that mainly is a preparation for the students master thesis.

The fourth semester consists of a 30 ECTS Master Thesis, where the students will conduct a research/development project related to green energy technology.

Teaching, learning methods and forms of assessment

Forms of teaching and learning:

A combination of different teaching methods are used. Lectures, flipped classroom, seminars, workshops, various types of exercises, laboratory tasks, project work, supervision and self-study are combined to provide the students with the tools they need to obtain the knowledge and skills they will need for the future. Projects in interdisciplinary groups promote collaboration skills, and teach the students to communicate across disciplines. The students will practice both written and oral communication.

During the course of the four semesters, the students will meet guest lecturers from industry and collaborative universities abroad. The study plan provides the opportunity for project work in close collaboration with industry partners. In addition, the students can participate in ongoing research projects at the Department of Engineering. For more details, see heading **Research and development work** below.

The students are expected to work between 750 and 900 hours each semester. In addition to the organized tuition, the students are expected to work independently and in groups with assigned tasks, solve exercises, read the curriculum, find and read other relevant literature, and prepare for exams.

The students will learn how to search for scientific literature and to critically review what they find to acquire new knowledge. This will prepare them for a future where the field of energy

technology is advancing towards new technological solutions. They will also obtain skills in various forms of academic writing, as well as in oral presentations.

Teaching materials
The students will work with analogue and relevant digital tools. The students are expected to pay for teaching materials such as textbooks and photocopies themselves. In addition, each student is expected to utilize their own laptop.

Language
The study is internationally oriented, and the tuition language is English. The students are expected to answer all exams in English, and deliver all written work and oral presentations in English.

Coursework requirements and Assessment
Most courses has some compulsory coursework requirements.
The coursework requirements are evaluated on a approved/not approved basis, and should be approved before the student can take the exams. See the course descriptions for details.
The course descriptions also give details about the possibilities for re-taking the assessment if the students fail. Generally, most written or oral exams can be re-taken maximum two times, while written reports can be revised one time. For each course grades are given from A to F, where A is the best grade, E is the lowest passed grade, and F is failed. Exams are graded by two sensors, for most of the courses one of these sensors will be external. An external sensor will always be used on the Master Thesis. The Master Theses is subject to electronic plagiarism control, as may also be the case with other courses and required coursework. Exam papers that are partly or entirely identical will not be approved and will be regarded as attempted cheating. For further information, please see Exam regulations for Østfold University College.

Research and development work

The *Master in Green Energy Technology* is located at the Department of Engineering, Østfold University College, where the employees carry out research related to various aspects of energy technology, such as smart grids, micro grids, materials, and innovation processes. Students are invited to participate with academic staff and guest researchers in professional research projects within and outside the institution. The diversity of the practical and theoretical research of the Department`s employees is one of the main sources of the education at all levels. The research of the academic staff takes place both inside and outside

the institution, on a high national and international level. The students will have the opportunity to actively participate in the research projects of the academic staff in the Master Thesis, and to a lesser extent also in some of the other project-based courses. In addition, we have a close contact with the local industry, and the students will have the opportunity to participate in research and development project in collaboration with the industry. The active participation and contributions of the students may take various forms such as practical and theoretical contributions, and sometimes within publications.

Internationalisation

Department of Engineering consists of an international department with different expertise and experience in the international research projects, development and innovation activities and teaching. The Department has an international network with exchange opportunities and appointments with various research and educational institutions.

All courses are taught in English, using solely English literature. This facilitates applicants from outside Norway. Students can also exchange to institutions outside Norway (see "Study Abroad").

Programme evaluation

To be able to offer relevant education of good quality, we are dependent on feedback from the students and on their participation in evaluating the programs of study. Each individual academic environment is responsible for adopting evaluation procedures at course level. See the course descriptions for details.

In addition to course evaluations, Østfold University College conducts periodic evaluations of the study program as a whole. In addition, NOKUT (the Norwegian Agency for Quality Assurance in Education) conduct the annual Student Survey on student perceptions on the quality of study programs in Norway. All students in this study program are given the opportunity to participate in the survey.

Studies abroad

Voluntary exchange / study abroad should normally take place in the 3rd semester and will extend over varying periods of time. Any of the courses in the 3rd semester can be exchanged

with other courses abroad, as long as the courses are relevant for the Master and secures sufficient learning outcome. It is also possible to take the Master Thesis abroad in the 4th semester. Exchange/study abroad must be discussed with and approved by supervisors and the program manager.

The Department of Engineering has agreements for internationalization and student exchanges at master's level with the following institutions:

Universidad de Castilla-La Macha - Spain

Hochschule Wismar - Germany

Queensland University of Technology - Australia

University of North Dakota - USA

University of Pisa - Italy

Högskolan Väst - Sweden

Universidad Politecnica de Cartagena - Spain

University of Vaasa - Finland

Piraeus University of Applied Sciences - Greece

The international coordinator at the Department of Engineering can be contacted for further information.

Work and future studies

Graduates from the Master program form a new and unique generation of professionals who will be called upon to tackle critical issues in renewable and sustainable energy management systems. They are distinguished by their technical and management knowledge and the skills

required to deal with a wide range of issues at the interface between energy, technology, innovation and science. With the increasing demand for environmentally friendly and sustainable energy solutions, the industry has a great need of professionals within this field, who are experienced in working in interdisciplinary groups to solve complex problems.

PhD-studies

The study will form the basis for PhD level research, and prepare the candidate for admission to relevant doctoral programs within energy technology. A completed master degree qualifies for admission to related PhD-studies. Note that one need a B or better average on the Master degree for the admission to PhD-studies at some institutions.

Career prospects

The study focuses on the possibilities and challenges of green energy technology. The study provides competence needed to work within the energy technology sector in both commercial companies, specialized consultancy agencies, policy and regulation defining public bodies and public services. Energy suppliers, energy distributors, and companies manufacturing or supplying energy technology solutions, components, materials, etc. are possible future employers. It is also possible to go into research or teaching, or to start up a new company based on energy technology innovation.

The candidates can work as project engineers, project leaders, or product/concept developers within energy technology. They are attractive employees for a variety of companies and bodies within production, delivery, service, counselling, policy development and administration/management, both nationally and internationally.

The study plan is approved and revised

The study plan is approved

Dean Geir Torgersen 22 August, 2019 Accredited by The Norwegian Agency for Quality Assurance in Education (NOKUT), 28.8.2018.

The study plan is revised

Programme coordinator Susana Garcia Sanfelix, 22.12.2023

The study plan applies to

2024 (autumn)

Programme Coordinator

Faculty of Computer Science, Engineering and Economics.
Department of Engineering, programme coordinator Susana Garcia Sanfelix and program manager Tore Gimse

Study model

Autumn 2024

Core courses

IRMGR40724 Adapting Technology to Circular Economy	**5** stp
IRMGR40924 Scientific Research and Methods	**5** stp
IRMGR40218 Renewable Energy	**10** stp
IRMGR40318 Materials for Energy Technology	**10** stp

Spring 2025

Only one profile choice available this year:

◯ Profile choice: Materials for Energy Technology

Core courses

IRMGR40824 Life Cycle Assesment (LCA)	**5** stp
IRMGR40418 Energy Technology, Policy and Sustainability	**10** stp

Autumn 2025

Core courses

IRMGR43524 Energy Technology Project	**10** stp

Elective courses (10 ECTS)

IRMGR42318 / Valgbart emne Project Development and Funding	**10** stp
IRMGR42824 / Valgbart emne Digital design fabrication	**10** stp

Spring 2026

Core courses

IRMGR44018 Master Thesis	**30** stp

Last updated from FS (Common Student System) July 18, 2024 12:16:15 AM

IRMGR40724 Adapting Technology to Circular Economy (Autumn 2024)

Facts about the course

ECTS Credits:
5

Responsible department:
Faculty of Computer Science, Engineering and Economics

Campus:
Fredrikstad.

Course Leader:
Susana Garcia Sanfelix

Teaching language:
English.

Duration:
½ year

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The course is connected to the following study programs

Compulsory course in the Master`s programme in Green Energy Technology

Lecture Semester

1th semester (autumn).

The student's learning outcomes after completing the course

Knowledge:

The student

- understands the background and consequences of the UN sustainability goals
- understands how social sustainability may impact social issues both nationally and internationally
- has knowledge of the EU strategy on Circular Economy
- has a theoretical knowledge on how to achieve optimal resource efficiency in a closed material loop
- has basic knowledge in writing as an engineer and reporting on a business level
- has basic knowledge of methods related to innovation and how to use these methods when working towards optimal resource efficiency in closed material loops.
- Has knowledge of the status of circularity in various communities and industries nationally and internationally
- Has basic knowledge of how digitalization and AI can support circular material flows.

Skills:

The student

- can perform an ethical analysis of possible consequences of material supply-chains in regard to the UN sustainability goals
- can analyze the business potential in identified possible improvements in the closed material loops
- can lead innovation workshop with an industry partner on closed circuit technology and possibilities suggested in reports
- has basic skills in writing as an engineer and reporting on a business level
- can analyze the social and economic effects of improving circularity in various communities internationally
- can analyze the overall effects on sustainability of alternative shifts in technology and energy sources

General competence:

The student

- has a solid understanding on the challenges connected to resource scarcity on a global level
- shows good cooperative skills in group work situations
- can work in close interaction with an industrial partner, and understands their business and challenges
- has an overall understanding on the ethical challenges regarding possible conflict between short term busyness goals and possible long term consequences of the lifecycle of new

and innovative solutions.

Content

The subject introduces the student to the principals outlined in EU priority on the translation to a circular economy, and how this will be a key framework factor for future business. The subject offers theoretical education on basic tools, but will mainly be focusing on the business-report to the industry-partner, and the process leading to this report.

Keyword for content:

- Adapting the UN sustainability goals in technology and business
- Ethical considerations regarding sustainability, utilization of hazardous substances, material supply-chains, and possible conflicts between short term busyness goals and possible long term consequences of the lifecycle of new and innovative solutions.
- Innovation tools
- Writing business reports
- The circular flow of resources, technical and biological, as an alternative to the take-make-waste economy

Forms of teaching and learning

- Lectures and guest speakers
- Literature-study
- Group work
- Workshop with group members and supervisor
- Case studies with industry partner

Workload

150 hours

Coursework requirements - conditions for taking the exam

- Approved pre-versions of business reports
- 4-5 small project assignments, individual or groups

Examination

This exam consists of two parts:

Part 1: Group (max. 5 students) report from project assignment. Counts 50% of the final grade

Part 2: Individual oral examination, 30 minutes. Counts 50% of the final grade.

Grades from A to F, where A is the best grade, E is the lowest passed grade, and F is failed

Examiners

One internal and one external examiner, or two internals

Conditions for resit/rescheduled exams

If the project report is graded as failed, the student will be given one more chance to improve the report.

If the student fails the oral exam, they can re-take this exam. A resit will be arranged in January/February the following semester.

Course evaluation

The course will be evaluated by a standardized electronic form.

Literature

The reading list will be published in Leganto.

Last updated from FS (Common Student System) July 18, 2024 12:15:14 AM

IRMGR40924 Scientific Research and Methods (Autumn 2024)

Facts about the course

ECTS Credits:
5

Responsible department:
Faculty of Computer Science, Engineering and Economics

Campus:
Fredrikstad.

Course Leader:
Shima Pilehvar

Teaching language:
English.

Duration:
½ year

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The course is connected to the following study programs

Compulsory course in the Master`s Programme in Green Energy Technology

Lecture Semester

First semester (Autumn)

The student's learning outcomes after completing the course

Knowledge:

The student

- has specialized insight into one topic within energy technology
- is able to utilize knowledge within new fields of energy technology
- has developed insight and understanding of the logic of scientific thinking and writing

Skills:

The student

- can analyze and critically examine scientific literature
- can structure and formulate technical arguments and reasoning
- can analyze relevant ethical research problems within energy technology.

General competence:

The student

- knows how to search for scientific literature
- is able to write a scientific report
- is able to orally present a scientific project for both specialists within the field and the general public
- can acquire new knowledge within a field by self-tuition.

Content

The scientific writing and thinking, ethical considerations related to research projects and the research design topics will be taught through lectures. The lectures will include dialogue with the students, to closely link the general ideas of the logics of science. On the literature search and state-of-the-art report, the students will work under supervision of course lecturer. During semester, each student should deliver an oral presentation about the state-of-the-art report during the semester and first draft of state-of-the-art report. This course includes:

- Qualitative, quantitative and mixed methods
- Scientific writing and peer-review
- Evaluating literature relevant to green energy
- Categorising publications, their contents and functions

Forms of teaching and learning

Lectures, presentations, quiz.

Coursework requirements - conditions for taking the exam

Approved individual state of the art report.

The literature references used in the report should be approved by the course responsible.

Examination

Oral presentation from state of the art report.

Duration: app. 30 minutes

Grades from A to F, where A is the best grade, E is the lowest passed grade, and F is failed.

Examiners

One internal examiner, one external or two internal examiner.

Conditions for resit/rescheduled exams

If the student fails the exam, he/she can re-take th exam in January the following semester.

Course evaluation

The course will be evaluated by a standardized electronic form.

Literature

The reading list will be published in Leganto.

Last updated from FS (Common Student System) July 18, 2024 12:15:14 AM

IRMGR40218 Renewable Energy (Autumn 2024)

Facts about the course

ECTS Credits:
10

Responsible department:
Faculty of Computer Science, Engineering and Economics

Campus:
Fredrikstad.

Course Leader:
Olav Aaker

Teaching language:
English.

Duration:
½ year

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The course is connected to the following study programs

Master in Green Energy Technology (Compulsory).

Lecture Semester

First semester (autumn).

The student's learning outcomes after completing the course

Knowledge:

The student

- has knowledge of current renewable energy sources, their current use and potential for future use
- has knowledge of the basic physical principles on which the energy sources rely
- has advanced knowledge of mathematical modelling of renewable energy processes
- has knowledge of smart grids and micro grids.
- has knowledge of heat transfer process in buildings

Skills:

The student

- can estimate renewable energy resources, like solar, wind power for a given site
- can calculate the necessary dimensions and equipment to build a powerplant with a specified energy source, and specified power output.

- can estimate the heat demand for buildings

General competence:

The student

- can write a scientific project report.
- use of digital tools for energy resources

Content

- Sources of renewable energy, such as:
  - Sun
  - Wind
  - Ocean waves and tidal forces
  - Hydropower
  - Biomass
  - Garbage and waste materials
- CO2 capture and related issues
- Mathematical models and dimensioning related to renewable energy plants
- Introduction to smart grids and micro grids that utilize renewable energy sources

Forms of teaching and learning

- Lectures

- Laboratory work, including mathematical modelling
- Project work: Prepare a report where an alternative energy powerplant is planned and proper dimensions are suggested.
- Use of digital tools

Workload

250-300 hours.

Coursework requirements - conditions for taking the exam

- 2 approved assignements

Examination

Oral seminar presentation, individual. Approximately 20 minutes included questions.

Grades from A to F, where A is the best grade, E is the lowest passed grade, and F is failed.

Examiners

Two internal examiners or one internal and one external.

Conditions for resit/rescheduled exams

A resit will be arranged in January/February the following semester.

Course evaluation

The course will be evaluated by a standardized electronic form.

Literature

The current reading list for AUTUMN 2022 can be found in Leganto.

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IRMGR40318 Materials for Energy Technology (Autumn 2024)

Facts about the course

ECTS Credits:
10

Responsible department:
Faculty of Computer Science, Engineering and Economics

Campus:
Fredrikstad.

Course Leader:
Anna-Lena Kjøniksen

Teaching language:
English.

Duration:
½ year

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The course is connected to the following study programs

Master in Green Energy Technology (Compulsory).

Lecture Semester

First semester (autumn).

The student's learning outcomes after completing the course

Knowledge:

The student

- has advanced knowledge regarding materials for energy technology applications
- is able to analyze scientific problems regarding materials for energy technolog.

Skills:

The student

- is able to analyze and critically examine different sources of information
- is able to analyze theories regarding materials for energy technology.

General competence:

The student

- is able to contribute to an interdisciplinary project in collaboration with other students
- is able to present a scientific topic orally

- knows how to search for scientific literature
- is able to write a scientific report.

Content

The course will provide the students with an overview of some selected materials that can be used for energy technology applications, and in-depth knowledge regarding one of these types of materials.

Advanced materials, such as phase change materials, can be used to reduce the energy needed to heat and cool buildings. Solar cells and solar collectors can convert solar energy to electricity/heat. Nanofluids have a great potential as heat transfer liquids. These are only some examples of the utilization of materials for energy technology applications. Understanding the mechanisms for how these materials work is essential for the development of new and improved materials.

Forms of teaching and learning

The first part of the course will be based on lectures, presenting some examples of advanced materials for energy technology applications. The examples will focus on new research in the field, both from our own research and from the scientific research literature.

The second part of the course will be based on interdisciplinary project group work, where the students will find new research literature and write a report about a selected application of materials for energy technology. The report should be in the form of a scientific review article, and clearly illustrate the current state-of-the-art and discuss the most important challenges that needs to be resolved in the future. This work will be supervised by the lecturer.

A seminar regarding presentation techniques will prepare the students for giving an oral presentation of their project work.

A seminar regarding search for scientific literature will prepare the students for finding relevant literature for the project.

Workload

250-300 hours.

Coursework requirements - conditions for taking the exam

- Project outline (group work)
- Preliminary report (group work)
- Attendance at Presentation Techniques Seminar, including five minutes oral group presentation of projects
- Attendance at Search for Scientific Literature Seminar

Examination

This exam has two components:

- Group project report.
- Individual oral exam, including oral presentation of the project 30 minutes and questions regarding project and curriculum from the lectures, 30 minutes.

The students will receive one final grade for the course as a whole.

Grades from A to F, where A is the best grade, E is the lowest passed grade, and F is failed.

Examiners

One internal and one external or two internal examiners.

Conditions for resit/rescheduled exams

If the project report is graded as failed, the students will be given one more chance to improve the report.

If the student fails the oral exam, they can re-take this exam. A resit will be arranged in January the following semester.

Course evaluation

The course will be evaluated by a standardized electronic form.

Literature

The current reading list for AUTUMN 2022 can be found in Leganto.

Last updated from FS (Common Student System) July 18, 2024 12:15:13 AM

IRMGR40824 Life Cycle Assesment (LCA) (Spring 2025)

Facts about the course

ECTS Credits:
5

Responsible department:
Faculty of Computer Science, Engineering and Economics

Campus:
Fredrikstad.

Course Leader:
Lars Gunnar Furelid Tellnes

Teaching language:
English.

Duration:
½ year

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The course is connected to the following study programs

Master in Green Energy Technology (Compulsory).

Lecture Semester

Second semester (spring).

The student's learning outcomes after completing the course

Knowledge:

The student

- understands the background and consequences of the UN sustainability goals
- understands how social sustainability may impact social issues both nationally and internationally
- has knowledge of the EU strategy on Circular Economy
- understands the principals of performing a Life Cycle Assessment for products
- has knowledge about EUs Candidate list (REACH) for avoiding hazardous substances
- has a theoretical knowledge on how to achieve optimal resource efficiency in a closed material loop
- has basic knowledge in writing as an engineer and reporting on a business level
- has basic knowledge of methods related to innovation and how to use these methods when working towards optimal resource efficiency in closed material loops.

Skills:

The student

- can perform a Life Cycle Assessment (LCA) using computer programs (SIMAPRO or similar)
- can plan and write a report as a feasibility study on improvements in LCA phases from an environmental standpoint and from a logistical standpoint
- can perform a LEAN analysis on material flows through the life span
- can perform an ethical analysis of possible consequences of material supply-chains in regard to the UN sustainability goals
- can analyze the business potential in identified possible improvements in the closed material loops
- can lead innovation workshop with an industry partner on closed circuit technology and possibilities suggested in reports
- can perform a substitution process to avoid hazardous substances in materials.

General competence:

The student

- has a solid understanding on the challenges connected to resource scarcity on a global level
- shows good cooperative skills in group work situations
- can work in close interaction with an industrial partner, and understands their business and challenges

- has an overall understanding on the ethical challenges regarding possible conflict between short term busyness goals and possible long term consequences of the lifecycle of new and innovative solutions.

Content

Life Cycle Assessment (LCA) evaluates the environmental impact of products. Throughout planning, production, and marketing, analyzing consumption quantities is crucial for adjusting business models. The subject introduces the student to the principals outlined in EU priority on the translation to a circular economy, and how this will be a key framework factor for future business. The subject offers theoretical education on basic tools, but will mainly be focusing on the business-report to the industry-partner, and the process leading to this report.

Keyword for content:

- Adapting the UN sustainability goals in technology and business
- LCA basic: Environmental indicators, phases in LCA (Life Cycle Assessment)
- LCA tools: Benchmarking performance for product-phases
- Ethical considerations regarding sustainability, utilization of hazardous substances, material supply-chains, and possible conflicts between short term busyness goals and possible long term consequences of the lifecycle of new and innovative solutions.
- Innovation tools
- Writing business reports

Forms of teaching and learning

- Lectures and guest speakers
- Literature-study
- Group work

- Workshop with group members and supervisor
- On the job observation

Coursework requirements - conditions for taking the exam

1 assignement

Examination

Multiple choice exam, individual.

Examiners

One internal and one external examiner or two internal.

Course evaluation

The course will be evaluated by a standardized electronic form.

Literature

The reading list will be published in Leganto.

Last updated from FS (Common Student System) July 18, 2024 12:15:18 AM

IRMGR40418 Energy Technology, Policy and Sustainability (Spring 2025)

Facts about the course

ECTS Credits:
10

Responsible department:
Faculty of Computer Science, Engineering and Economics

Campus:
Fredrikstad.

Course Leader:
Gunnar Andersson

Teaching language:
English.

Duration:
½ year

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The course is connected to the following study programs

Master in Green Energy Technology (Compulsory) and Master in Applied Computer Science (elective course)

Lecture Semester

Second semester (spring).

The student's learning outcomes after completing the course

Knowledge:

The student

- understands relevant concepts and frameworks from Science, Technology and Innovation Studies and their application to energy technology transformation
- can identify and evaluate relevant technologies
- is able to analyze key policy and societal debates shaping transition pathways to low carbon and sustainable energy systems.

Skills:

The student

- can find and use arguments and information on different energy technology options and can critically evaluate such material

- can critically evaluate new business models and innovation in shaping transition pathways to low carbon and sustainable energy systems.

General competence:

The student

- can critically evaluate contributions to debates on energy technology issues, and decisions on them
- can contribute to innovation processes
- is able to find information on different energy technology options, and critically evaluate such material.

Content

Energy technology, policy and sustainability provides students with an understanding of contemporary societal and policy debates around key energy technologies in the context of the transition towards more sustainable and lower carbon energy systems.

Forms of teaching and learning

The lecture series is divided into four parts:

- Part 1 introduces historical case studies and relevant concepts and frameworks.
- Part 2 introduces key debates around a range of relevant technologies
- Part 3 discusses the transition towards sustainable and lower carbon energy systems, new business models and innovation

- Part 4 explores key debates seen from an industry perspective

Parts 1-3 are organized as a combination of introductory lectures, seminars and workshops. Part 4 is organized as a project with regional industry.

Workload

250-300 hours.

Practical training/internship

Part 4 as a project with regional industry.

Coursework requirements - conditions for taking the exam

- Group work

Examination

Portfolio assessment, group.

Group grades from A to F, where A is the best grade, E is the lowest passed grade, and F is failed.

Examiners

One internal and one external examiner or two internal.

Conditions for resit/rescheduled exams

If the group fails the portfolio assessment, they have to resubmit an improved version of the portfolio assessment.

Course evaluation

Continuous evaluation during the semester, where the evaluation method is agreed between the teacher and the students.

The course will be evaluated by a standardized electronic form.

Literature

The current reading list for 2023 Spring can be found in Leganto

Last updated from FS (Common Student System) July 18, 2024 12:15:18 AM

IRMGR41518 Experimental Methods (Spring 2025)

Facts about the course

ECTS Credits:
5

Responsible department:
Faculty of Computer Science, Engineering and Economics

Campus:
Fredrikstad.

Course Leader:
Shima Pilehvar

Teaching language:
English.

Duration:
½ year

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The course is connected to the following study programs

Master in Green Energy Technology (Compulsory in Materials for Energy Technology profile).

Lecture Semester

Second semester (spring).

The student's learning outcomes after completing the course

Knowledge:

The student

- has advanced knowledge of two experimental methods within energy technology
- can analyze experimental limitations and possible artefacts.

Skills:

The student

- can utilize two experimental methods for research and development in an independent manner
- can critically analyze data obtained by two experimental research methods.

General competence:

The student can solve problems related to experimental work.

Content

The students will learn how to use two different experimental research techniques, and how to critically analyze and interpret the data obtained with these techniques. The experimental techniques should be relevant for the student's planned Master Thesis. The course is module-based, where each module teaches one experimental technique. The student should select two relevant modules for the course.

The course is research based, and each student should therefore conduct measurements that results in new knowledge of the measured systems. The students should preferably conduct measurements on samples that are relevant for their planned master project, e.g., a small pre-study. The project reports should include a discussion regarding analysis and interpretation of the data (including relevant references to scientific research literature), and a discussion of possible errors and artefacts of both the measurements and interpretations.

Examples of available modules:

- Rheology - Viscoelastic properties of liquids and gels
- Dynamic light scattering and electrophoretic mobility - Determining hydrodynamic radius and zeta potentials
- Isothermal calorimetry - Heat flow rate of a sample due to chemical or physical changes in the sample
- Diffusive wave spectroscopy - Microrheology and size determination of turdid samples
- Electrospinning - Fabricating nanofibers and nanoparticles by electrospinning

- Mechanical testing of materials - Compressive strength, elasticity modulus, toughness, stress-strain curves
- Guarded hot plate method: thermal conductivity
- Lab scale setup for Thermal transmittance (U-Value) in buildings

Forms of teaching and learning

The teaching will be a combination of supervision and screencasts.

Workload

125-150 hours.

Coursework requirements - conditions for taking the exam

- At least 85% attendance for lectures/lab classes
- Lab safety course.
- Lab introduction course including passed test of laboratory skills.
- Laboratory assignments according to the two chosen modules.

Examination

This exam concists of two parts:

Part 1: Project report from chosen module number 1. 50% of the evaluation

Part 2: Project report from chosen module number 2. 50% of the evaluation

Both partial exams must me graded as passed to get a final grade in the subject.

Grades from A to F, where A is the best grade, E is the lowest passed grade, and F is failed.

Examiners

Two internal examiners.

Conditions for resit/rescheduled exams

If a project report is graded as failed, the students will be given one more chance to improve this report. A re-take will be arranged in August the following semester.

Course evaluation

The course will be evaluated by a standardized electronic form.

Literature

The current reading list for 2023 Spring can be found in Leganto

Last updated from FS (Common Student System) July 18, 2024 12:15:18 AM

IRMGR41618 Solid State Physics and its impact on Modern Energy Technologies (Spring 2025)

Facts about the course

ECTS Credits:
10

Responsible department:
Faculty of Computer Science, Engineering and Economics

Campus:
Fredrikstad.

Course Leader:
Litian Wang

Teaching language:
English.

Duration:
½ year

Table of contents

- Course evaluation
- Literature

The course is connected to the following study programs

Master in Green Energy Technology (Compulsory in Materials for Energy Technology profile).

Recommended requirements

An advanced knowledge and skills in physics and advanced mathematics.

Lecture Semester

Second semester (spring).

The student's learning outcomes after completing the course

Knowledge:

The student

- has advanced knowledge of some central topics of solid state physics
- has a broad overview of application and contemporary development related to energy technologies.

Skills:

The student

- can disseminate main ideas and principles related to materials associated with energy technologies
- can use advanced methods for material choice using the material database GRANTA
- can analyze and evaluate materials with various sets of criteria or material indexes
- can conduct preliminary scientific analysis and technical evaluation of materials associated with energy technologies
- can make proper evaluation of technical constructions/instrumentations associated with energy technologies
- is capable to participate actively in scientific research and development.

General competence:

The student can communicate and disseminate in their independent practice in research and development.

Content

The course provides an introduction to solid state physics and its application to the modern energy technologies. The emphasis is placed on the understanding of the fundamental phenomena and corresponding principles related to the contemporary development in materials science.

The course will focus on following subjects:

Part I: Fundamentals

- periodic structure, and associated reciprocal space, and its application in diffraction experiment
- lattices/defects in real materials and their roles in thermo-/electrical conductivity
- free Fermi electron gas theory. State density and Fermi level and their relation to electrical conductivity
- electron in periodic potentials: Energy band, band-gap and classification of materials
- semiconductors: Band-gap, Charge carrier, doping, p-n joint and photovoltage effect
- reciprocal lattices and its determination and the concept Brillouin-zones
- equilibrium concentration of point defects and its relationship with temperature and pressure
- diffusion processes and Ficks laws
- heat capacity originated from lattice vibration and thermo-conductivity
- periodic potential and formation of energy band structure
- Brillouin zone boundary and band-gap
- classification of metals, semiconductors and insulator. In terms of band structure
- charged carrier distribution in intrinsic and doped semiconductors. Electron holes and their roles in diodes p-n joint
- phenomena in low dimension materials
- phenomena in nanomaterials.

Part II: Specific application areas

Subjects can be one of the following:

- superconductor
- solar cell technology
- LED technology
- battery storage technology
- functional nanomaterials.

Part III: Methodology for industrial applications:

- GRANTA material database and material choices.

Forms of teaching and learning

The first part of the course (Fundamentals) will be given by a combination of lectures, exercises and home assignments.

The second part of the course (Applications) will be group work where students will conduct intensive literature search on a self-chosen application field. A technical report will be written, and the report will provide a proper review of the literature together with an analysis or evaluation for national technological development in the field. This work will be supervised by the lecturer.

The third part of the course (Methodology) will be given as a workshop or seminar where various methods for defining material indexes in each application area will be discussed and be

implement/tested. The results and discussions will be documented by a short but highly specialized technical report.

Workload

250-300 hours.

Coursework requirements - conditions for taking the exam

One home assignment, individual

Two home assignments, group

Examination

This exam consists of two parts:

- Partial exam 1: Individual written mid-term exam 3 hours. 50% of the evaluation. Allowed materials under examination: Personal assignment file.
- Partial exam 2:Group scientific review reports. 50% of the evaluation.

The students will receive one grade for each partial exam and one final grade for the course as a whole.

Grades from A to F, where A is the best grade, E is the lowest passed grade, and F is failed.

Examiners

One internal and one external examiner or two internal.

Conditions for resit/rescheduled exams

If the student fails Partial exam 1, they can re-take this exam in the same semester.

If the student fails Partial exam 2, they can revise the reports one time.

In this case, a second evaluation and final grading will be arranged in August the following semester.

Course evaluation

The course will be evaluated by a standardized electronic form.

Literature

The current reading list for 2023 Spring can be found in Leganto

Last updated from FS (Common Student System) July 18, 2024 12:15:19 AM

IRMGR43524 Energy Technology Project (Autumn 2025)

Facts about the course

ECTS Credits:
10

Responsible department:
Faculty of Computer Science, Engineering and Economics

Course Leader:
Shima Pilehvar

Duration:
½ year

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The student's learning outcomes after completing the course

Knowledge:

The student

- has specialized insight into one topic within energy technology
- is able to utilize knowledge within new fields of energy technology
- has developed insight and understanding of the logic of scientific thinking and writing, as well as the ethical considerations related to a research project.

Skills:

The student

- can analyze and critically examine scientific literature
- can structure and formulate technical arguments and reasoning
- is able to plan a research project, in agreement with existing ethical norms
- can analyze relevant ethical research problems within energy technology.

General competence:

The student

- is able to write a scientific report
- knows how to search for scientific literature
- is able to orally present a scientific project for both specialists within the field and the general public
- can acquire new knowledge within a field by self-tuition.

Content

In the course, the students will learn about scientific research design. This insight will be the knowledge base and the basis for independent reflections when the students perform a literature search to find current research literature related to the planned topic of their Master

Thesis. Based on this literature, they will write a report that outlines the state-of-the-art within this topic.

Based on the state-of-the-art report, the students will:

- define the objective(s) of their Master Thesis
- clarify how the objective(s) are progressing beyond the state-of-the-art
- determine how to meet the objective(s), within the framework of both research design and ethics
- decide which methods and experimental techniques they will use
- make a first assessment of which experiments should be conducted
- put up a realistic progress plan for the Master Thesis
- write a project planning report that clarifies all these points including explanations for the choices that are made.

Workload

250 - 300 hours

Coursework requirements - conditions for taking the exam

Deliver project report

Examination

Oral presentation from project report.

Grades from A to F, where A is the best grade, E is the lowest passed grade, and F is failed.

Literature

The reading list will be published in Leganto.

Last updated from FS (Common Student System) July 18, 2024 12:15:17 AM

IRMGR42318 Project Development and Funding (Autumn 2025)

Facts about the course

ECTS Credits:
10

Responsible department:
Faculty of Computer Science, Engineering and Economics

Campus:
Fredrikstad.

Course Leader:
Bjørn Gitle Hauge

Teaching language:
The language during the lecture will be English. Basic Norwegian language is recommended regarding the Norwegian funding programmes.

Duration:
½ year

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The course is connected to the following study programs

Master in Green Energy Technology (Elective).

Recommended requirements

Basic knowledge of Project Management and basic Norwegian language knowledge.

Lecture Semester

Third semester (autumn).

The student's learning outcomes after completing the course

Knowledge:

The student

- has knowledge of different funding sources
- has knowledge of evaluation of different funding applications
- has knowledge of the bureaucratic hierarchy that governs funding programs
- can analyse the political processes connected to various funding sources.

Skills:

The student

- knows how to budget a project for funding purposes
- knows how to get political support for funding
- knows how to conduct a funding process towards success.

General competence:

The student

- can conduct an interdisciplinary project funding process
- can understand the political basis for different governmental funding programs
- is able to write an application for project funding.

Content

The course will provide the students with an overview of different sources of project funding, and how different applications are evaluated.

The students will learn how to write an application for project funding, working on real cases. The application can be written for an external industrial or public partner or for a project where HiØ is the main applicant. Applications that are considered to have high quality might be submitted as an actual application.

Forms of teaching and learning

The course will be taught as a combination of lectures, seminars and project work.

The students learn about various sources of project funding, practice on evaluating funding applications, and write an application for external funding in interdisciplinary teams.

It is expected that the student will perform extended self-study regarding the funding programs.

Workload

250-300 hours.

Coursework requirements - conditions for taking the exam

Attendance at minimum 75% of seminars/external assignments.

A minimum of 4 written project submissions and oral presentations must be approved (group work).

Examination

This exam consists of two components:

- Funding application - project plan (group work). A preliminary grade will be awarded on the basis of this report
- Group oral examination, which may adjust the preliminary grade maximum two grades up or down. A final, individual grade will be awarded after the oral examination

The funding application - project plan has to be evaluated as passed before the oral examination.

Grades from A to F, where A is the best grade, E is the lowest passed grade, and F is failed.

Examiners

One internal and one external examiner or two internal.

Conditions for resit/rescheduled exams

If the funding application is graded as failed, the student will be given one more chance to improve the application.

If the student fails the oral examination, a re-take of the oral exam will be arranged in the following semester.

Course evaluation

The course will be evaluated by a standardized electronic form.

Literature

The current reading list for 2023 Autumn can be found in Leganto

Last updated from FS (Common Student System) July 18, 2024 12:15:16 AM

IRMGR42824 Digital design fabrication (Autumn 2025)

Facts about the course

ECTS Credits:
10

Responsible department:
Faculty of Computer Science, Engineering and Economics

Campus:
Fredrikstad

Course Leader:
Shima Pilehvar

Teaching language:
English

Duration:
½ year

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The course is connected to the following study programs

Elective course in Master in Green Energy Technology

Lecture Semester

3rd semester

Content

In this course, key phenomena and concepts in the field of digital fabrication are introduced and analysed. The course presents digital fabrication from two perspectives: digital fabrication technologies and the maker movement. The technological perspective is based on hands-on activities and project work to familiarize students with technologies and processes for developing physical prototypes including additive and subtractive production technologies and electronics. The perspective on maker movement discusses digital fabrication in terms of enabling sustainable and democratizing practices for the digital society.

Presented technologies include, but not limited to:

- Modelling for digital fabrication
- 3D printing
- Laser cutting and engraving
- CNC machining
- Electronics programming and production

Forms of teaching and learning

The course consists of project work and theoretical modules. The following methods are used:

- Project Work
- Laboratories and workshops
- Lectures
- Supervision

The course is hands-on and practical, and it is expected that students work on their own and in groups.

Workload

280 hours

Coursework requirements - conditions for taking the exam

The student must during the semester:

- complete up to 4 mandatory projects (individually or in groups of 2-3 students) handed in at predefined dates by the course responsible

Examination

Prototype and oral presentation (individually or in groups of 2-3 students)

The students need to develop a prototype from project work. The students are given an individual tentative grade on the prototype using the A - F grading scale. This grade can be adjusted at the oral presentation.

Duration of oral presentation is approx.15-20 min. Except the presentation, no supporting materials are allowed. An individual grade will be given.

The prototype must be passed before the oral presentation can be carried out.

All group members must contribute to the prototype and oral presentation.

If the student decides to challenge the assessment, the prototype must be re-assessed. If the new assessment affects the tentative grading of the prototype, a new oral presentation will be arranged.

Examiners

One external and one internal examiner, or two internal examiners

Conditions for resit/rescheduled exams

Upon re-examination, both parts of the examination must be retaken

Course evaluation

The course will be evaluated by a standardized electronic form.

Last updated from FS (Common Student System) July 18, 2024 12:15:17 AM

IRMGR42718 Materials for Energy Efficient Buildings (Autumn 2025)

Facts about the course

ECTS Credits:
10

Responsible department:
Faculty of Computer Science, Engineering and Economics

Campus:
Fredrikstad.

Course Leader:
Susana Garcia Sanfelix

Teaching language:
English.

Duration:
½ year

Table of contents

The course is connected to the following study programs

Master in Green Energy Technology (Compulsory in Materials for Energy Technology profile).

Recommended requirements

Materials for Energy Technology (10 ECTS).

Lecture Semester

Third semester (autumn).

The student's learning outcomes after completing the course

Knowledge:

The student

- has advanced knowledge regarding materials for energy efficient buildings
- is able to analyze scientific problems of materials for energy efficient buildings
- has advanced knowledge regarding the energy efficiency of buildings from a life cycle perspective

Skills:

The student

- is able to conduct computer simulations to evaluate how different material strategies influence the embodied energy of the building
- is able to conduct computer simulations of buildings containing use phase materials
- is able to plan and conduct a limited research project under supervision

General competence:

The student

- is able to collaborate and contribute to team projects
- is able to present results from a research project in writing and discuss the project orally.

Content

The students will learn about how different materials can be utilized to enhance the energy efficiency of buildings, keeping in mind the life cycle assessment of the building and environmental considerations. The students will learn how to utilize models and simulations to predict the energy efficiency of buildings and building materials.

The following topics will be covered:

- Energy efficiency in buildings from a life cycle perspective
- Use of Life-Cycle Assessment for choosing materials with low embodied energy
- Optimizing the choice of heat insulating materials in a lifecycle perspective
- New materials with extremely good heat insulation properties based on nanotechnology
- Materials for airtight structures in buildings for reducing heat loss

- Reduction of building temperature fluctuations by utilization of materials with high thermal mass and with phase change materials
- Computer simulations of the energy efficiency in buildings, including the use of phase change materials (PCM) as one of the components
- Utilization of BIM (building information models) to register and control the use of different building materials.

Forms of teaching and learning

- Lectures
- Project work in groups
- Screencasts
- Supervision

The students will conduct two projects working in the same groups.

Project 1. Computer simulation of the energy saved during the operative phase by including phase change materials (PCM) in a building material. The computer simulations will be conducted utilizing measured parameters of the material. The project is research-based, and accordingly each group will conduct simulations that should result in new knowledge. The groups will conduct several computer simulations, either varying different aspects of the material, or examining the effects of different outdoor conditions (daily temperature variations, seasonal temperature variations, different climatic zones, variations in solar radiation, etc).

Project 2. LCA analysis of the materials utilized in Project 1, including the energy efficiency aspects.

The results from the two projects should be presented into two different reports. The students can choose whether they deliver a classical project report, or a report in the form of a research article. This reports are part of the exam in the course.

Workload

250-300 hours.

Coursework requirements - conditions for taking the exam

- Approved results from computer simulation of Project 1
- Approved results from LCA analysis of Project 2

Required coursework must be approved before the student can take the exam

Examination

This exam consists of two components:

- Component 1: Group project report on the combined results from projects 1 and 2.
- Component 2: Individual oral exam, 30 minutes. The students will be examined in both the theoretical part of the curriculum and regarding the content of the project report.

In order to take the oral exam, the group project must be passed.

The students will receive one final grade for the course as a whole; grades on sub-evaluations will not be shown.

Grades from A to F, where A is the best grade, E is the lowest passed grade, and F is failed.

Examiners

Two internal examiners.

Conditions for resit/rescheduled exams

If the student fails the oral exam, they can re-take this exam maximum two more times. The students do not need to deliver a new report in order to re-take the oral exam.

If the project report is graded as failed, the students will be given one more chance to improve the report.

Course evaluation

The course will be evaluated by a standardized electronic form.

Literature

The current reading list for 2023 Autumn can be found in Leganto

Last updated from FS (Common Student System) July 18, 2024 12:15:16 AM

IRMGR44018 Master Thesis (Spring 2026)

Facts about the course

ECTS Credits:
30

Responsible department:
Faculty of Computer Science, Engineering and Economics

Campus:
Fredrikstad.

Course Leader:
Susana Garcia Sanfelix

Teaching language:
English.

Duration:
½ year

Table of contents

The course is connected to the following study programs

Master in Green Energy Technology (Compulsory).

Absolute requirements

Passed at least 70 ECTS of the previous Master courses.

Passed the course Scientific Research and Methods (10 ECTS).

Lecture Semester

Fourth semester (spring). It is possible to apply for following this course in the autumn semester.

The student's learning outcomes after completing the course

Knowledge:

The student

- has specialized insight into one topic within energy technology
- has thorough knowledge of scientific methods and ethical considerations within energy technology
- is able to utilize knowledge within new fields of energy technology
- Is able to analyze scientific problems within energy technology.

Skills:

The student

- is able to critically analyze different sources of information, and use them to structure and develop academic arguments
- is able to analyze and apply different theories within energy technology
- can utilize relevant methods for research development
- can work independently with practical and theoretical problem solving
- is able to plan and conduct a research project, including ethical reflections related to energy technology and future implications of technological advances.

General Competence:

The student

- can utilize his/her knowledge and skills within new areas to accomplish advanced tasks and projects
- knows how to search for scientific literature
- can write a comprehensive thesis regarding a specialized subject within energy technology
- is able to orally present a scientific project for both specialists within the fields and the general public.

Content

The student will perform a research project under supervision. The project can be connected to the research of one of the lecturers, or be a project in collaboration with an industry partner or one of the collaboration institutions abroad. The student is expected to apply previously acquired knowledge and skills related to their chosen specialized topic in addition to previously acquired knowledge and skills related to research design, the logics of scientific thinking and writing and ethical considerations in a research project.

Forms of teaching and learning

The students will work on a research project under supervision of one of the lecturers. The project either can be an individual project, or conducted in interdisciplinary teams. For the team projects, the tasks and contributions of each student must be clearly specified.

Workload

750-900 hours.

Coursework requirements - conditions for taking the exam

None.

Examination

The exam consists of two components: Master Thesis, oral examination.

For individual projects:

Master Thesis combined with an oral presentation of approximately 45 minutes duration aimed at the general public directly followed by an oral examination of approximately 45 minutes duration.

The examination committee will grade the written report before the oral presentation and examination. The written report must be passed in order to be allowed an oral presentation

and examination. The committee will adjust the grade maximum two grades up or down based on the oral presentation and examination.

For group projects:

Master Thesis. One report for the whole group, together with a specification of the contribution of each student. Combined with individual oral presentations aimed at the general public directly followed by an individual oral examination.

The examination committee will grade the written report before the oral presentation and examination. The specified contribution of the individual student counts as 50 % and the report as a whole counts as 50%. The committee will adjust the grade based on the oral presentation and examination.

Only the final grade will be given as the grade of the course. Grading presupposes that all preceding study plan courses are passed.

Grades from A to F, where A is the best grade, E is the lowest passed grade, and F is failed.

Examiners

Examination committee of one internal and one external examiner.

Conditions for resit/rescheduled exams

If the written report is not passed, the student can hand in a revised report one time, at a deadline specified by the Master Thesis supervisor. If the revised report is passed, the student is allowed an oral presentation and examination.

In case of a final grade complaint, the written report will be re-examined by a complaint committee. If the grade from the complaint committee differs from the grade the examination committee gave on the written report, the student must re-take the oral

presentation and examination and receive a new grade from the complaint committee. If the complaint committee agrees with the examination committee on the grade of the written report, the student will keep the original grade.

Course evaluation

The course will be evaluated by a standardized electronic form.

Literature

The students will conduct a literature search to find literature that is relevant for the project.

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