

Study Plan for Master in Green Energy Technology (120 ECTS) (2019–2021)

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

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 international.

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 degree in engineering or equivalent of at least 180 ECST

or

2) Other relevant natural science bachelor degree or equivalent of at least 180 ECST

It requires a minimum grade point average from the qualifying education of C (according to ECTS Standards).

Proof of English proficiency is also required.

For the profile choice with specialization in Smart Energy Technology, relevant degrees must be within the fields of energy technology, electrical engineering, mechatronics, cybernetics, physics, 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.

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.

During the first semester, the students acquire an interdisciplinary basis and overview within the field of energy technology, preparing them for the more advanced compulsory courses and a specialization profile in the second semester. The selection of main disciplinary profile, either Smart Energy Technology or Materials for Energy Technology, in the second semester and a broad variation of elective courses in the third semester provides the opportunity for each student to choose their individual field of specialization.

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.

It is possible to exchange the elective courses with master courses that are relevant to energy technology from other universities/university colleges in Norway or abroad. More details on such exchange is included in the paragraph about the third semester below.

The first semester is fixed for all students, with three compulsory courses, each of 10 ECTS. These will provide the students with a general interdisciplinary background within green energy technology, teach the students to work in interdisciplinary groups, how to search for scientific literature, 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. The 10 ECTS compulsory part will provide the students with knowledge and skills related to how social, political and cultural values affect science, and how more sustainable and lower carbon energy systems can be achieved by implementing innovation and new business models. The 5 ECTS compulsory part is the first part of the course Scientific Research and Methods, which is completed early in the third semester. This course provides the students with knowledge and skills related to the ethics and logics of academic thinking and writing. The students will also choose their Master Thesis topic and conduct a comprehensive literature study resulting in specific research questions for the Master Thesis, sufficiently framed and defined by state-of-the-art research literature related to their chosen field of interest. In addition to the compulsory part of the second semester, each student chooses 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 are constituted by two courses, counting totally 15 ECTS points (5+10), both compulsory for the chosen profile.

To enter the Smart Energy Technology profile, students are expected to possess basic knowledge and skills related to electrical circuits. Students with a bachelor degree in electrical engineering and/or computer science automatically fulfill this recommendation. Students with other bachelor level educations can acquire the recommended knowledge and skills related to electrical circuits by passing relevant exams at bachelor level. The students do not need to provide the program manager with formal documentation, but such relevant exams are highly recommended for students choosing this profile of specialization. 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 does not have any specified recommended prior knowledge other than the ones provided by the compulsory courses of the first semester. 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 providing and sustainable technology applications for future energy use efficiency.

The third semester consists mainly on elective courses. There is a 5 ECTS compulsory part of the course Scientific Research and Methods finishing in September, allowing students to exchange to other institutions. Such exchange is facilitated by a comprehensive list of cooperation agreements with institutions outside Norway. Courses attended and passed in other institutions must be preapproved by the study program manager in collaboration with the student's supervisor and the office of international affairs at Østfold University College, to ensure sufficient learning outcome for each individual student. The elective courses cover a range of topics related to energy technology, allowing each student to pursue their individual interest. Any combination ensures sufficient learning outcome (except the partial combination Special Curriculum I and II, which is not possible due to course content overlap).

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 Faculty 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 have some compulsory coursework requirements. The coursework requirements have to be approved before the student can take the exam or deliver the assessment requirements for the course. See the course descriptions for details. The students will be evaluated by a combination of coursework requirements, project reports and various forms of exams. The coursework requirements are evaluated on an approved/not approved basis, and should be approved before the student can take the exams or deliver the project work that will give the basis for the grade of the course. The coursework requirements and the bases for the assessment varies depending on the nature of each course. More details are given in the course descriptions. 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 Thesis 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 Faculty 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 Faculty 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

Faculty of Engineering consists of an international faculty with different expertise and experience in the international research projects, development and innovation activities and teaching. The Faculty 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.

Reading list

See the course descriptions.

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

- Universidad de Castilla-La Mancha - 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 Faculty 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. Examples of such are the PhD program in Mathematics and Natural Sciences at the University of Oslo, PhD in Energy and Process Engineering, or Materials Science and Engineering at Norwegian University of Science and Technology, the PhD program at the Faculty of Engineering and Science at the University of Agder, PhD in Science and Technology at Norwegian University of Life Sciences and the Doctoral Education at the Faculty of Mathematics and Natural Sciences, University of Bergen. Note that one needs 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

Head of Studies, Annette Veberg Dahl, 22 August 2019

The study plan applies to

2020 (autumn)

Programme Coordinator

Faculty of Engineering.

Faculty of Engineering, program manager Shima Pilehvar.