

STUDENT INFORMATION GUIDE

MASTER'S DEGREE PROGRAMME

ENERGY AND ENVIRONMENTAL SCIENCES (EES)

2016/2017

Faculty of Mathematics and Natural Sciences

University of Groningen

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Chapter 1 How to use this student information guide?

1.1 Purpose of this guide

This student information guide of the master's degree programme Energy and Environmental Sciences aims to inform students about educational matters concerning the master's degree program.

Next to this student information guide there is the **faculty Student Handbook** with general information (available on Nestor and the internet).

Consult both !!

This information guide contains the most relevant specific information for MSc EES students. Obviously an information guide like this is never complete. If you have any additional questions please consult the course manager (programme degree manager), Michiel Berger (tel. +31 (0) 50 363 4603, email: m.r.berger@rug.nl).

Students interested in the MSc. Energy and Environmental Sciences should contact the course manager, Michiel Berger (mail: m.r.berger@rug.nl). Questions concerning the information in this guide or other educational matters can also be addressed to him.

This information guide concerns the academic year 2016/2017.

Chapter 2 Context and history of EES

2.1 Introduction

"The health of natural systems has a profound impact on the quality of life. Natural systems purify air and water, stabilize climate and soils, and provide us with raw resources. However, some 60 per cent of the planet's ecosystem services are currently being degraded by human activities. These activities include polluting the atmosphere with excess greenhouse gases, draining freshwater aquifers, over harvesting our forests and fisheries, polluting our oceans and introducing alien species to new regions. As a result, 20 per cent of the world's coral reefs have been lost, 40 per cent of the planet's rivers have been fragmented, and our climate has been disrupted. Directly or indirectly, these problems affect us all. They affect our health, our security, our capacity to plan for the future and even our freedom. The good news is that there is time to change and we still have enough natural capital left to give humanity a bright future for our children and grandchildren. We just have to start making changes. Steps like the Kyoto Protocol are pointing us in the right direction. They are urgent, necessary measures to correct humanity's course and put us on a path to a better future."

United Nations, Millennium Ecosystem Assessment (2005)

2.2 Position of EES within the RUG, FMNS and ESRIG

Although the Energy and Sustainability Research Institute Groningen (ESRIG) is a Research Institute, bundling strengths leads to new educational possibilities as well. In the Master phase the Energy and Environmental Sciences (EES) programme has been operational for several years, under responsibility of IVEM and CIO. Both the IVEM and the CIO are member groups of ESRIG of the Faculty of Mathematics and Natural Sciences (FMNS) at the University of Groningen (RUG). The FMNS is one of the largest natural sciences faculties in the Netherlands.

2.3 Energy and Sustainability Research Institute Groningen (ESRIG)

In 2009 a new Research Institute was founded in the Faculty of Mathematics and Natural Sciences (FMNS), which concentrates on Energy and Sustainability Research. The initiative bundles existing Faculty Research potential in these areas. Several groups in the FMNS do research in the field of energy and related sustainability subjects. This includes sustainable implementation of scientific knowledge in society. By bundling these groups into one Research Institute, visibility and critical mass has substantially improved.

ESRIG's mission is performing energy and sustainability research. The institute's character is balanced, with both an experimental part (laboratory and field experiments), and a part with model studies and studies into societal interaction with scientific knowledge.

Besides the full member groups, ESRIG has a number of associated members. These are groups in other research institutes, with a thematical overlap and co-operation in research and education to ESRIG.

The EES master is closely linked to ESRIG and this relation will continue to grow in the future.

See <http://www.rug.nl/research/esrig> for more information on ESRIG and the ESRIG research groups.

2.4 Energy Academy Europe (EAE)

In 2012 the initiative of the Energy Academy Europe started. The University of Groningen, Hanze University of Applied Sciences and corporations like Gasterra initiated the EAE. The vision of the EAE: *"We facilitate the acceleration of the energy transition.*

As an international center of excellence, Energy Academy Europe brings together relevant activities, partners and networks to facilitate the acceleration of the energy transition. We do so, under our three pillars: education, research and innovation.

Market, laws and regulations, and society at large are all part of the energy system. Our energy future depends on the integration of the elements of this system. Via our projects, we are growing towards system integration with the ultimate goal of transitioning to a more sustainable energy system. Our cooperation with top quality educational and research institutes and our vast network within the energy industry ensure that all EAE programmes are relevant to the energy sector and at the cutting edge of energy technology. We consolidate the leadership of the Netherlands in energy expertise and to contribute to the transition to a sustainable, reliable and commercially viable energy economy."

Early 2017 a new building at the Zernike Campus will become the headquarters of the EAE. Most ESRIG groups will also move to this new, sustainable building. This will start a new era for energy and sustainability education, research and innovation in Groningen.

More info on the Energy Academy Europe on their [website](#).

2.5 Development of the master-program

The current Master's degree programme Energy and Environmental Sciences (EES) is based on a history of over 40 years research and education in this field.

Since insights in Energy and Environmental sciences change fast the master programme is evaluated and updated yearly, and most recent insights in the research field are incorporated in the programme.

Chapter 3 The Organisation

3.1 Programme Director

The master's degree programme Energy and Environmental Sciences is part of the Graduate School of Science (GSS). The Programme Director of EES is responsible for the organization and quality of the EES-program. Dr.ir. Sanderine Nonhebel is the current Programme Director of EES.

3.2 Programme Committee MSc EES (OC)

The OC plays a crucial role in the evaluation and innovation of the curriculum. Follow-ups of evaluations are the responsibility of the OC in concordance with the course manager. The OC advises the Programme Director (and staff) of EES based on these evaluations and on personal experience.

The Programme Committee consists of three staff members and three student members. The course manager acts as the secretary of the committee. Student members of the OC are elected annually; staff members hold office for two years. At the end of September 2016 there will be an application round for new OC student members. In case you are interested to join the OC please contact one of the members or the Course Manager.

- 3 EES staff members
- 3 EES students
- Drs.Michiel Berger (secretary)

3.3 Board of Examiners (BoE)

The Board of Examiners (BoE) monitors the procedures and progression of the exams, and deals with a number of specific issues: Organization and co-ordination of examinations, appeals regarding courses or exams, appointment of the examiners and external specialists involved in the examinations. Also admission of students, and ascertaining individual deficiencies and remedial programs is a task of the Board. And the BoE has to approve the individual programmes of each student.

- Prof Rien Herber (chairman)
- Drs.Michiel Berger (secretary)

3.4 Course manager (Degree programme coordinator)

The course manager (or Degree programme coordinator) of Energy and Environmental Sciences is Drs. Michiel Berger. You may ask him all type of questions related to the contents of master's degree programme Energy and Environmental Sciences. You can contact Michiel Berger personally, by phone or by email (room number: 5114.0027C; tell: +31 (0) 50 363 4603, email: m.r.berger@rug.nl).

3.5 Study advisor of MSc EES

The study advisor of Energy and Environmental Sciences is Drs. Solita van Duin. She will assist students in finding solutions to all kind of problems encountered while studying. This concerns matters like study pace, personal problems or an improvement in study methods. You can also discuss social matters with the study advisor if you need a confidant for personal problems.

All you discuss with the study advisor is confidential.

You can meet Solita van Duin during her daily visiting hours in the Bernoulliborg or make an appointment at <https://svanduin.youcanbook.me/>.

3.6 Participation of students within EES

An active participation of the students is essential for a good education. Students can participate in the programme and the organisation of the education in different ways. All students will be asked to fill in evaluation forms concerning the courses of the Energy and Environmental Sciences. Other suggestions are also welcome. Please contact the course manager or the specific staff member.

Students play an important role in the Programme Committee (OC). Three out of the six members of the OC are students. The students choose their own representatives for the OC.

Students who are interested to represent their fellow students in the OC can report this to the student representatives or to the course manager, Michiel Berger.
Questions, remarks, suggestions and new active student representatives are always welcome!!

3.7 Staff

Due to regular changes in staff we refer to the websites of ESRIG.
For a list of ESRIG staff see:

- <http://www.rug.nl/research/esrig/about-esrig/people>,

3.8 Alumni

The EES master's degree programme tries to stay in contact with the graduated students (alumni). Apart from the many professional contacts the EES-staff has with alumni there is a special EES Alumni group on LinkedIn. Please contact the course manager via LinkedIn to be part of this group. Besides this alumni are requested to inform the course manager about changes in their address and professional situation.

Chapter 4 Educational Program

4.1 Programs

The two-year Master's degree programme in Energy and Environmental Sciences is connected to the Energy and Sustainability Research Institute Groningen (ESRIG). It has a wide range of specializations related to the research themes of the various ESRIG research groups. The Systems-orientated specialisations have a strong design-orientated, systems-approach character based in natural sciences. What are the possibilities for a sustainable future for a region, for a country or for the world as a whole? What characterizes the optimal transition routes towards a sustainable future? In general scenario and model studies are an important element of this track.

The Experimental-orientated specialisations are linked to the experimental research within ESRIG groups. This covers topics such as the enhanced greenhouse effect and the carbon cycle in atmosphere and ocean, gas combustion studies, geo-energy, polymer solar cells, biofuels, climate history. Every specialisation starts with the 'EES Base Programme' of five compulsory modules followed by a specialising part. In addition, the programs include an optional part and two research projects.

4.1.1 Programme content

The programme covers two years (120 EC). See the schedule below.

The first year comprises a range of modules: the 5 courses of the base-programme including a statistics course, and specialising and optional courses. The specialising and optional courses vary according to your research interests and background.

The second year may be 'research oriented' or 'professional oriented'.

Teaching within EES is modern and student-orientated: active student participation, student responsibility and the development of research and communication skills are essential.

Computer work and models are an indispensable part of coursework and research.

The individual programme is tailor-made: depending on your background, research interests and future career prospects your programme may vary.

1st year Base programme (25 EC):

- Impacts of Energy and Material Systems (IEMS)
- Sustainable Use of Ecosystems (SUE)
- Sustainability & Society (S&S)
- Systems Integration and Sustainability (SIS)
- Data Analysis and Statistical Methods (DASM)

1st year Specializing/optional courses (35 EC):

- This package of 35 EC prepares the student for the research projects. Specialising courses provide students specialised knowledge and skills required for research projects at a specific research group. Optional courses provide student with additional knowledge and skills useful for their research and/or future career. The content of the package is tailor-made and discussed with the tutor. Depending on the student's background and the topic of the research projects more courses can be obligatory (and less optional). The Board of Examiners has to approve each individual study programme.

2nd year Option 1: Research oriented (60 EC)

- 1st research project at ESRIG group (30 EC)
- 2nd research project at RUG or external (30 EC)

2nd year Option 2: Professional oriented (60 EC)

- research project at ESRIG group (40 EC)
- external internship (20 EC)

For more information and a description of the programme and the courses see [OCASYS](#).

4.2 Individual tutor system

Regarding the individual choices within the MSc EES programme good student support is essential. Therefore in the first semester of the first year each student is assigned an individual tutor. This tutor is a senior staff member of an ESRIG group.

The tutor functions as a personal coach with regard to the contents of the study programme. Students will have to discuss the contents of their study programme with their tutor. Approval of the tutor is required when submitting your study programme to the Board of Examiners.

Of course students are free to consult their tutor on other matters also.

At least three major phases of the programme have to be discussed with the tutor:

- the compulsory, specialising and optional courses of the 2nd semester of the first year.
- the 1st Research project
- the 2nd Research project or internship

NB. Each of these phases needs the approval of your tutor and the Board of Examiners before entering the new phase.

For each of these phases a form is available that you have to mail to the course manager (after approval by your tutor).

4.3 2nd Year Projects (60 EC)

4.3.1 Option 1: Research oriented

This option is especially designed for students who want to continue their MSc with a research career. This option contains two research projects of 30 EC each. The first research project has to be performed at an ESRIG group (or ESRIG associate group) depending on the specialization. The second research project may also be performed outside the university at a company, consultancy, government institution, research institute, etc. The research projects are individual.

You can start with your research projects after completing the compulsory courses of your program.

Consult the course manager and your tutor first about the possibilities.

Many useful and practical matters concerning the research projects are included in the web pages of the MSc EES on the intranet of the RUG. This information contains:

- details about the procedure
- learning outcomes
- the thesis assessment form
- research proposals of former projects
- possible research topics
- other useful tools and instructions

During the research period students are obliged to attend the ESRIG colloquia and other activities organised by the specific ESRIG group (see 4.3.3 and 4.3.4).

4.3.2 Option 2: Professional oriented

This option is especially designed for students who want to continue their MSc with a professional career in consultancy, government, industry, etc..

This option contains an extended research project of 40 EC and an internship of 20 EC. The extended research project has to be performed at an ESRIG group (or ESRIG associate group) depending on the specialization. The internship has to be outside the university at a company, consultancy, government institution, etc. The research project and the internship are individual.

You can start with your research project after completing the compulsory courses of your program.

Consult the course manager and your tutor first about the possibilities.

Many useful and practical matters concerning the research project and the internship are included in the web pages of the MSc EES on the intranet of the RUG. This information contains:

- details about the procedure

- learning outcomes
- the research thesis and internship assessment form
- research proposals of former projects
- possible research topics and internships
- other useful tools and instructions

During the research project students are obliged to attend the ESRIG colloquia and other activities organised by the specific ESRIG group (see 4.3.3 and 4.3.4).

4.3.3 ESRIG Colloquia

Students are obliged to attend at least 20 ESRIG colloquia during their master program. The colloquia inform students about other environmental research and the student will see examples of how a presentation should (or should not) be done and provide insights career perspectives.

Students receive a form to register their attendance during colloquia.

The ESRIG colloquia are in general on Tuesdays at 16.00h.

4.3.4 Research group meetings

During their research projects students are member of a research group. Each research group has meetings where research related topics are discussed. In addition most research groups have special meetings to supervise/coach master students during their research projects. Attending these meetings is obligatory and part of the assessment of the research project.

Chapter 5 Regulations

This Chapter contains the regulations for the EES master's program.

5.1 Teaching and Examination Regulations (OER) of EES

The Teaching and Examination Regulations is established by board and council of the faculty. It contains a number of regulations with respect to structure and content of the educational programmes, form and frequency of examinations, admission regulations, tutoring etc.

The general OER can be found in the general Student Handbook of the FMNS and online at <http://myuniversity.rug.nl/portal/>

For the EES-specific content of the OER see also Appendix 1 of this information guide.

5.2 Rules and Regulations of the Boards of Examiners

The Rules and Regulations of the Board of Examiners contain a number of additional regulations concerning examinations: e.g. registration for examinations, procedures for exemptions, assessment, fraud, etc.

The Rules and Regulations of the Board of Examiners can be found in the general Student Handbook of the FMNS and online at:

<http://myuniversity.rug.nl/infonet/studenten/fwn/reglementen/renr>

5.3 Student charter of the RUG

The Student Charter provides an overview of the rights and obligations of both students and the University. It is based on national legislation, particularly the Higher Education and Research Act (WHW), supplemented by regulations that are specific to the University of Groningen. These latter regulations are set out in the appendices to the Student Charter.

You can find the Student Charter in the general Student Handbook of the FMNS.

Appendix A: Teaching outcomes of the Msc. Energy and Environmental Sciences (EES) (art. 1.3)

Learning Outcomes MSc Energy and Environmental Sciences (EES)

INTRODUCTION

The first part of the learning outcomes is specific and concerns knowledge and skills. Most of this is part of the obligatory courses for all MSc EES students (Base programme and Advanced Statistics course).

The second part is more general: what is our master capable of (doing independent research). This part is mostly covered by the research projects.

Also see the table at the bottom.

General Aims

The general aims of the master's degree program EES are:

- to prepare students for an independent professional career; in this context this means being able to carry out fundamental or applied scientific research, as well as applying state of the art scientific knowledge in a wide variety of practical situations;
- to provide a learning environment for enabling students to develop skills, knowledge and insight in a specialization area of the field of study. to have students develop the ability to clearly and concisely communicate the acquired knowledge to others;
- to let students develop the ability to critically reflect, taking into account social and ethical aspects.

OBJECTIVES

The aims of the program result in the following objectives:

Specific academic knowledge and skills for the master's degree program EES.

The graduate is able:

- a) to analyze:
 1. Energy and resource use in societies and ecosystems and their impacts on the climate/planet;
 2. (Dis)advantages of the use of various energy sources using the people, planet, profit approach;
 3. Current and future developments in the energy/environmental research field;
 4. Policy developments in the energy/environment field.
- b) to assess whether changes in systems will affect energy and resource use and their consequences.
- c) to discuss the role of other academic (non-natural science) disciplines in the energy and/or environmental research field.
- d) to distinguish career perspectives within the energy/ environmental field.

General academic skills for the master's degree program EES

The graduate is able:

1. to write a review about literature in relevant subfields.
2. to effectively gain information within the field of Energy and Environmental Sciences (EES).
3. to formulate a research plan based on a general problem description in a subfield of EES.
4. to analyze and assess state-of-the-art research information and draw conclusions from these results.
5. to collaborate in a multidisciplinary team.
6. to communicate his/her findings to the scientific community (oral presentation, written reports and debates).
7. to design, conduct and evaluate experiments/scenarios/other scientific methods.
8. to evaluate his/her own results and conclusions compared to knowledge in the literature.
9. to function scientifically in a situation in which knowledge and research skills within the field of EES are required.
10. to consider its own position in society to come to a sensible choice of profession.

outcomes														
	specific				general									
	Sa	Sb	Sc	Sd	G1	G2	G3	G4	G5	G6	G7	G8	G9	G10
courses														
IEMS	X	X							X					
SUE	X	X							X					
S&S	X	X	X						X	X			X	
SIS	X	X			X				X				X	
DASM								X			X			
Thesis 1 (variant 1)				X	X	X	X	X		X	X	X	X	X
Thesis 2 (variant 1)				X	X	X	X	X	X	X	X	X	X	X
Thesis 1 (variant 2)				X	X	X	X	X		X	X	X	X	X
Internship (variant 2)				X	X	X		X	X	X		X	X	X

Appendix B: Specializations of the degree programme (art. 2.2)

Appendix C: Content of the degree programme (art. 2.3)+

Appendix E: compulsory order of examinations (art. 3.2)

1. Msc Energy and Environmental Sciences:

module	ECTS	entry requirements	assessment	practical
Impacts of Energy and Material Systems (IEMS)	5	-	see OCASYS	see OCASYS
Sustainable Use of Ecosystems (SUE)	5	-	see OCASYS	see OCASYS
Society and Sustainability (S&S)	5		see OCASYS	see OCASYS
Systems Integration and Sustainability (SIS)	5		see OCASYS	see OCASYS
Data analysis and statistical methods (DASM)	5		see OCASYS	see OCASYS
Specialisation/Optional modules**	35	see OCASYS	see OCASYS	see OCASYS
1 st Research Project (variant 1)	30	IEMS, SUE, S&S, SIS, DASM, specialisation modules	plan, process, presentation, written report	Research
2 nd Research Project (variant 1)	30	IEMS, SUE, S&S, SIS, DASM, specialisation and optional courses, 1 st Research Project	plan, process, presentation, written report	Research
Research Project (variant 2)	40	IEMS, SUE, S&S, SIS, DASM, specialisation modules	plan, process, presentation, written report	Research
Internship (variant 2)	20	IEMS, SUE, S&S, SIS, DASM, specialisation and optional courses, Research Project	plan, process, presentation, written report	Project

** depending on the student's background and the topic of the training and/or master thesis more courses can be obligatory (and less optional), the Board of Examiners will decide on this.

Appendix D: Specialisation and Optional modules of the degree programme (art. 2.4)

The Specialisation and Optional modules comprise 35 EC.

Depending on the student's background and the topic of the training and/or master thesis a package of specialisation courses and optional courses is composed as part of the MSc EES programme. The contents of these specialisation and optional courses are discussed with a senior staff member (tutor) and have to be approved by the tutor and the Board of Examiners. The Board of Examiners has to approve the individual package of specialisation and optional courses.

Appendix F Admission requirements (art. 4.1; 4.2)

Requirements for admission to the Msc Energy and Environmental Sciences:

Holders of the following Bachelor's degrees from the University of Groningen are considered to have sufficient knowledge and skills and will be admitted to the Master's degree programme in Energy and Environmental Sciences on that basis:

- a Bachelor's degree in Biology
- a Bachelor's degree in Life Science and Technology
- a Bachelor's degree in Pharmacy
- a Bachelor's degree in Pharmaceutical Sciences
- a Bachelor's degree in Chemistry
- a Bachelor's degree in Chemical Engineering
- a Bachelor's degree in Physics
- a Bachelor's degree in Applied Physics
- a Bachelor's degree in Astronomy
- a Bachelor's degree in Mathematics
- a Bachelor's degree in Applied Mathematics
- a Bachelor's degree in Computing Science
- a Bachelor's degree in Industrial Engineering and Management
- a Bachelor's degree in Artificial Intelligence