

1. Introduction

This assessment plan is a systematic description of the testing and assessment modes for all study components in the curriculum of the Master's degree programme in Energy and Environmental Sciences (EES), 2023-2024. The plan is based on the assessment policy of the Faculty of Science and Engineering, as set out in the FSE Quality Assurance Manual and the protocol setting out the duties and powers of the Faculty's Board of Examiners (FSE Protocol Board of Examiners).

The assessment plan for the curriculum consists of the following parts:

1. Objective(s) of the degree programme.
2. The learning outcomes of the degree programme.
3. Descriptions of the study components, as set out in the appendices to the Teaching and Examination Regulations 2023-2024 of the degree programme.
4. Descriptions of the content of each study component in Ocasys, the online course catalogue. The following elements are relevant in this context:
 - objectives
 - description of content
 - lecturers
 - assessment mode(s) and calculation of final mark
 - mode(s) of instruction.
5. An overview of the examiners and a detailed assessment mode for each study component. This overview is based on the curriculum approved by the Programme Committee, as set out in the appendices to the Teaching and Examination Regulations 2023-2024 for the degree programme.
6. A matrix showing the relationship between the study components and the detailed learning outcomes for each competence area.

Parts 3 and 4 are not included in this document. For the descriptions of the study components, see the Appendices to the Teaching and Examination Regulations 2023-2024 for the MSc EES. Descriptions of the content of each study component can be found in Ocasys, the online course catalogue (<http://www.rug.nl/ocasys/>) for the MSc EES: <https://ocasys.rug.nl/2023-2024/catalog/programme/60608?legacy=true>

2. Objectives of the degree programme

The general objective of the MSc EES is to offer education addressing the important global challenges with respect to energy and environment – present, past and in the future - in an interdisciplinary approach from a societal and natural sciences perspective. This field of study is of importance for all parts of society, like research, policy, business, and non-governmental groups. For all these parties, Master graduates with deep and broad knowledge and skills in the field of energy and environment are needed. Therefore, the MSc EES aims to prepare students for a career at an academic level in research, government, and business with different work profiles related to the field of energy and environmental sciences like experimental research, system analysis and evaluation, and problem analysis and solving.

The objectives of the Master's degree programme 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.

3. Learning outcomes of the degree programme

As set out in the Appendices Teaching and Examination Regulations for the Master Energy and Environmental Sciences 2023/2024.

The aims of the EES program result in the following learning outcomes:

Specific academic knowledge and skills for the MSc EES

The graduate is able:

Sa) to analyse:

1. Energy and resource use and their impact on the environment and on the planet;
2. (Dis) advantages of the use of various energy sources from a sustainability viewpoint;
3. Current and future developments in the energy & environment research field;
4. Policy developments in the energy & environment field.

Sb) to assess how changes in societal, environmental or technical systems will affect energy and resource use and their consequences.

Sc) to evaluate the role of other academic non-natural science disciplines in the energy & environment research field.

Sd) to determine its career perspectives within the energy & environment field.

General academic skills for the MSc EES

The graduate is able:

- G1. to write a review about literature in relevant subfields;
- G2. to effectively gain information within the field of Energy and Environmental Sciences (EES);
- G3. to formulate a research plan based on a general problem description or question in a subfield of EES;
- G4. to analyze and assess state-of-the-art research information and draw conclusions from these results;
- G5. to collaborate in a multidisciplinary team;
- G6. to communicate its own findings to the scientific community (oral presentation, written report and debate);
- G7. to design, conduct and evaluate experiments/scenarios/other scientific methods;
- G8. to evaluate its own results and conclusions compared to knowledge in the literature;
- G9. to function scientifically in a situation in which knowledge and research skills within the field of EES are required;
- G10. to consider its own position in society to come to a sensible choice of profession.

4. Overview of examiners and assessment modes for study components

In this section, an overview of the examiners and a detailed assessment mode for each study component is given. This overview is based on the curriculum approved by the Programme Committee, as set out in the appendices to the Teaching and Examination Regulations 2023-2024 for the degree programme.

The abbreviations for the relevant modes of assessment:

- Written exam with open questions (WE) (can be a digital exam)
- Oral exam (OR)
- Assignment (AST)
- Practical Work (PR)
- Presentation (P)
- Report (R)

Course units	Course coordinator	Other lecturers	Second examiner	Mode(s) of Assessment
Impact of Energy and Material Systems (IEMS) (WMEE002-05)	HAJ Meijer	GAH Laugs, JM Miocic, C Rigollet Guest lecturers: PW Leenes, F Ruzzenenti, T Schoot Uiterkamp	JM Miocic	WE, AST
Sustainable Use of Ecosystems (SUE) (WMEE003-05)	S Nonhebel	PW Leenes, EJ Stamhuis, J Zevenberg, Guest lecturers: P Boute, JD Driesens, AP Grootjans, W Liu, KR Timmermans, several external specialists	PW Leenes	WE, AST (AST is including P)
Sustainability and Society(S&S) (WMEE005-05)	PJ Upham	M.H.J. de Bont, A.S. Maqbool, A Teladia	AS Maqbool	WE, P, AST
Systems Integration and Sustainability (SIS) (WMEE006-05)	MAH van den Broek	GAH Laugs	F Ruzzenenti	AST (is including a final assignment)
Data Analysis and Statistical Methods (DASM) (WMEE001-05)	U Dusek		HAJ Meijer	WE, AST, R
Core electives				
Modeling Energy and Material Systems (MEMS) (WMEE009-10)	MR Berger	MA van den Broek, KS Hubacek, GAH Laugs, F Ruzzenenti	Successor of RMJ Bender (specific expertise is absolutely necessary for MEMS/MSc EES)	WE, AST, R
Global Change (GC) (WMEE008-05)	HAJ Meijer	H Chen, U Dusek, HAJ Meijer	H Chen	WE, AST, R
Compulsory modules				
Colloquia Energy and Environmental Sciences (WMEE017-00)	EJ Stamhuis			Mandatory attendance, see Ocasys for more information
Career Perspectives (EES) (WMEE018-00)	EJ Stamhuis			Mandatory attendance, see Ocasys for more information
Scientific Integrity (WMEE019-00)	EJ Stamhuis			AST, mandatory attendance, see

				Ocasys for more information
Electives				
Geo-Energy and Subsurface Processes (WMEE004-05)	JM Miocic		HAJ Meijer	WE, AST
Climate Modelling (WMEE010-05)	R Bintanja	H Chen en several guest lecturers	H Chen	R
Energy and Complexity Nexus (WMEE012-05)	F Ruzzenenti		KS Hubacek	WE (take home exam), AST (including R), OR after exercises
Conceptualizing and Modeling Human-Environmental Systems (WMEE011-05)	KS Hubacek		F Ruzzenenti	AST (including 5% participation)
Radiocarbon dating and Analysis (WMEE013-05)	MW Dee	SWL Palstra, D Paul	HAJ Meijer	OR, AST
Fuel Cell Systems (WMEE015-05)	A Purushothaman Vellayani	A.G. Amladi, H. Farhan Khola, V. Kyriakou, TH Woudstra	TH Woudstra	WE
Nuclear Power Technology (WMEE014-05)	CE Rigollet		N Kalantar-Nayestanaki	IT, WE, P
Experimental Methods of Trace Gas Research	A Mokhov	MW Dee, HAJ Meijer	HAJ Meijer	PR, WE, R
Electives coordinated by other Master's degree programmes		See Ocasys course descriptions and assessment plan of the corresponding Master's degree programme		
Research projects				
Research Project 1 (WMEE905-30/40)	See list of examiners			PR, P, R
Research Internship/Research Project 2 (WMEE906-30)	See list of examiners			PR, P, R
Minor Future Planet Innovation				
Global Challenges (WBEE002-10)	GAH Laugs	MR Berger, J Graver, MJ van den Nieuwenhof-Schilstra, M van Rijssel, J Zevenberg	J Zevenberg	WE, R

Global Integration (WBEE004-05)	S Grooters	J Zevenberg	J Zevenberg	AST, P
Sustainable Contributions to Society (WBEE003-15)	GAH Laugs	S Grooters, MJ van den Nieuwenhof-Schilstra, J Zevenberg Guest lecturers: MR Berger, J Graver, M van Rijssel	J Zevenberg	AST, P, R
Other				
Environment and Development (WBEE001-05)	MR Berger	PW Leenes, S Nonhebel, J Zevenberg	S Nonhebel	AST, WE
Processes Energy and Materials Modeling (WMEE016-05) (this course is in practice the first part of the MEMS course (WMEE009-10))	See MEMS, WMEE009-10	See MEMS, WMEE009-10		OR, AST, P, R
Paper Energy (WBEE005-05)	MR Berger		M van den Broek	AST, R

5. Relationship between obligatory course units, core electives, Master's projects and the learning outcomes of the MSc EES

For an overview of the abbreviations of the specific and general learning outcomes of the MSc EES, see Part 3 of this assessment plan on page 2.

LEARNING OUTCOMES														
	Specific				General									
	Sa	Sb	Sc	Sd	G1	G2	G3	G4	G5	G6	G7	G8	G9	G10
OBLIGATORY COURSE UNITS														
Impact of Energy and Material Systems (IEMS)	X	X							X					
Sustainable Use of Ecosystems (SUE)	X	X				X		X	X	X				
Sustainability and Society (S&S)	X	X	X						X	X			X	
Systems Integration and Sustainability (SIS)	X	X			X				X				X	
Data Analysis and Statistical Methods (DASM)								X			X			
COMPULSORY MODULES														
Scientific Integrity													X	
Colloquia Master										X				
Career Perspectives														X
CORE ELECTIVES														
Modeling Energy and Material Systems (MEMS)	X	X	X		X	X	X	X	X	X	X	X	X	
Global Change (GC)	X	X	X		X	X		X		X		X		
Electives						X								
PROJECTS														
Research project 1	X	X		X	X	X	X	X		X	X	X	X	X
Research Internship/Research Project 2	X	X		X	X	X	X	X	X	X	X	X	X	X
Internship (only for cohort 2019-2020 or before)	X	X		X	X	X		X	X	X		X	X	X

6. List of examiners for MSc EES, containing

a. supervisors (examiners) and second examiners for individual (research internships/) research projects

b. course coordinators/teachers in EES-curriculum (see part 4 of this assessment plan)

Initials	Name	Research unit	Remarks
M.R.	Berger	IREES	Only second examiner for research internships/projects, examiner for Minor Future Planet Innovation
R.	Bintanja	Ocean Ecosystems	Honorary professor
P.	Boelen	Biomimetics	Only second examiner for research internships / projects in Biomimetics
M.K.	Boer, de	Graduate school of SSE	
M.A.	Broek, van den	IREES	
W.R.	Browne	Molecular Inorganic Anorganische Chemie — Stratingh Institute of Chemistry	Second examiner
H.	Chen	CIO	Associate professor
M.W.	Dee	CIO	TT
U.	Dusek	CIO	TT
G.J.W.	Euverink	ENTEG	
M.	Gharisefard	Docenten SEC — EMT - Docenten Team 1	Assistant professor
S.	Grooters	Docenten X-SSE — EMT - Docenten Team 1	Examiner for Minor Future Planet Innovation
A.P.	Grootjans	IREES	Emeritus, but active
S.M.A.C.	Heuven, van	CIO	Only second examiner for research internships / projects in CIO
K.S.	Hubacek	IREES	Full professor
N	Kalantar-Nayestanaki	Nuclear Energy	Full professor
M	Kavatsyuk	Nuclear Energy	TT
L.J.A.	Koster	Photophysics and OptoElectronics — Zernike Institute for Advanced Materials	Full professor
G.A.H.	Laugs	Docenten X-SSE — EMT - Docenten Team 1	Examiner for Minor Future Planet Innovation
P.W.	Leenes	IREES	Retired, but active
D.	Lentink	Biomimetics	

A.S.	Maqbool	IREES	FSE-fellow
H.A.J.	Meijer	CIO	Full professor
R.	Middag	CIO	Honory professor
J.M.	Miocic	Geo-Energy	TT
A.V.	Mokhov	Energy Conversion	
H.C.	Moll	IREES	Emeritus, but active
H.A.J.	Mulder	Docenten SEC — EMT - Docenten Team 1	
P.	Nienhuis	IREES	Guest-researcher
M.J.	Nieuwenhof-Schilstra, van den	Docenten X-SSE — EMT - Docenten Team 1	Lecturer
S.	Nonhebel	IREES	Associate professor
D.	Paul	CIO	Only second examiner for research internships / projects in CIO
W.	Peters	CIO	Also professor at Wageningen University
W.H.	Poll, van de	Biomimetics	Lecturer
A.	Purushothaman Vellayani	Energy Conversion	Full professor
C.M.	Ree	ScienceLinx	Lecturer
C.E.	Rigollet	Lecturers Physics-EMT- Lecturers team 1	Lecturer
M.	Rijssel	Docenten X-SSE — EMT - Docenten Team 1	Examiner for Minor Future Planet Innovation
F.	Ruzzenenti	IREES	TT
H.A.	Scheeren	CIO	Only second examiner for research internships/projects in CIO
A.J.M.	Schoot Uiterkamp	IREES	Emeritus, but active
E.J.	Stamhuis	Biomimetics	Associate professor
K.R.	Timmermans	Ocean Ecosystems	Honorary professor
P.J.	Upham	IREES	
A.	Vakis	ENTEG	Associate professor
H.J.	Windt, van der	IREES	Emeritus, but active
T.H.	Woudstra	Energy Conversion	Second examiner for courses and research internships / projects regarding Thermodynamics
J.	Zevenberg	Docenten X-SSE — EMT - Docenten Team 1	Examiner for Minor Future Planet Innovation