Appendices Teaching and Examination Regulations MSc Energy and Environmental Sciences 2020-2021

Final version – July 2020

Appendix I: Learning outcomes of the MSc Energy and Environmental Sciences (EES) (art. 3.1)

INTRODUCTION
Appendix 1 presents the two parts of the EES learning outcomes. The first part of the learning outcomes is specific and concerns knowledge and skills. These learning outcomes are covered in the obligatory part of the EES programme.
The second part of the learning outcomes is more general. It focusses on the final skills a student is capable of (i.e. doing research independently). This part is mostly covered by the research projects.

OBJECTIVES
The aims of the EES programme result in the following objectives:

Specific academic knowledge and skills for the master’s degree program EES.
The graduate is able:
Sa) 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.
Sb) to assess whether changes in systems will affect energy and resource use and their consequences.
Sc) to discuss the role of other academic (non-natural science) disciplines in the energy and/or environmental research field.
Sd) to distinguish career perspectives within the energy/ environmental field.

General academic skills for the master’s degree program 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 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 his/her findings to the scientific community (oral presentation, written reports and debates).
G7. to design, conduct and evaluate experiments/scenarios/other scientific methods.
G8. to evaluate his/her 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.

Appendix II: Tracks/Specializations of the degree programme (art. 3.5)
The Master does not have tracks/specializations.

Appendix III: Content of the degree programme (art. 3.6)
Appendix V: Entry requirements and compulsory order of examinations (art. 4.4)

Table 2: Overview of the obligatory courses

<table>
<thead>
<tr>
<th>Course Unit</th>
<th>ECTS</th>
<th>Practical</th>
<th>Entry Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Obligatory courses</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data Analysis and Statistical Methods (DASM) (WMEE001-05)</td>
<td>5</td>
<td>Yes</td>
<td>None</td>
</tr>
<tr>
<td>Impacts of Energy and Material Systems (IEMS) (WMEE002-05)</td>
<td>5</td>
<td>Yes</td>
<td>None</td>
</tr>
<tr>
<td>Sustainable Use of Ecosystems (SUE) (WMEE003-05)</td>
<td>5</td>
<td>Yes</td>
<td>None</td>
</tr>
<tr>
<td>Sustainability and Society (S&amp;S) (WMEE005-05)</td>
<td>5</td>
<td>Yes</td>
<td>None</td>
</tr>
<tr>
<td>Systems Integration and Sustainability (SIS) (WMEE006-05)</td>
<td>5</td>
<td>Yes</td>
<td>None</td>
</tr>
</tbody>
</table>

Table 3: Overview of the different variants.

<table>
<thead>
<tr>
<th>Variant 30/30</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Obligatory courses</strong></td>
<td>25</td>
</tr>
<tr>
<td>Specialisation course, see Table 3</td>
<td>5 or 10 or 15 (at least one module is required)</td>
</tr>
<tr>
<td>Optional courses, see Table 4 and 5</td>
<td>For optional and specialisation</td>
</tr>
<tr>
<td>Course(s)</td>
<td>ECTS</td>
</tr>
<tr>
<td>-----------</td>
<td>------</td>
</tr>
<tr>
<td>Research Project 1 (WMEE905-30)</td>
<td>30</td>
</tr>
<tr>
<td>Research Internship/Research Project 2 (WMEE906-30)</td>
<td>30</td>
</tr>
</tbody>
</table>

### Variant 40/30

<table>
<thead>
<tr>
<th>Obligatory courses</th>
<th>25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specialisation course, see Table 3</td>
<td>5 or 10 or 15 (at least one module is required)</td>
</tr>
<tr>
<td>Optional courses, see Table 4 and 5</td>
<td>For optional and specialisation course(s) in total 25 ECTS are needed.</td>
</tr>
<tr>
<td>Research Project 1 (WMEE905-40)</td>
<td>40</td>
</tr>
<tr>
<td>Research Internship/Research Project 2 (WMEE906-30)</td>
<td>30</td>
</tr>
</tbody>
</table>

### Variant Science, business and policy

<table>
<thead>
<tr>
<th>Obligatory courses</th>
<th>25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optional course, see Table 4 and 5</td>
<td>5</td>
</tr>
<tr>
<td>Research Project 1 (WMEE905-30)</td>
<td>30</td>
</tr>
<tr>
<td>Introduction Science &amp; Policy (WMSE002-10)</td>
<td>10</td>
</tr>
<tr>
<td>Introduction Science &amp; Business (WMSE001-10)</td>
<td>10</td>
</tr>
</tbody>
</table>
In addition to the above scheme the following rules apply:
- Depending on the student’s background and the topic of the intended research project(s) a package of specialisation modules and electives (See Table 3, 4 and 5) is composed. This package of specialisation and optional courses is discussed with the tutor (a senior staff member) and has to be approved by both the tutor and the Board of Examiners.
- The student is allowed to choose optional course(s) from another Master degree programme, which is (are) not mentioned in Table 3, 4 or 5. The student needs to motivate his/her choice. The tutor and the Board of Examiners have to approve this choice.
- Research project 1 must be an internal project, performed at an ESRIG (Energy and Sustainability Research Institute) group under supervision of one of the examiners of the degree programme. For the assessment two examiners of the degree programme must be involved.
- Research Internship/Research Project 2 may be performed at an ESRIG group but may also be performed outside the university at a company, consultancy firm, government institution, research institute or another university. The supervisor from the external organization has to be on academic level. The university supervisor has to be one of the examiners of the degree programme. For the assessment two examiners of the degree programme must be involved. If this part will be performed abroad the student has to get approved the research proposal by the board of examiners of the degree programme before he/she will start.
- The subject of the SBP-internship must be clearly related to the scientific domain of the EES master programme (see Appendix I, 1). Therefore, two examiners must be involved in the assessment of the internship: one SBP-examiner and one examiner of the degree programme.
- To pass the final assessment of the EES programme the student has to have completed the following modules: Colloquia Energy and Environmental Sciences (WMEE017-00), Career Perspectives (EES) (WMEE018-00) and Scientific Integrity (WMEE019-00).

Appendix IV: Electives (art. 3.7)

Table 3. Overview of the specialisation courses

<table>
<thead>
<tr>
<th>Course unit</th>
<th>EC</th>
<th>Practical</th>
<th>Entry Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modeling Energy and Material Systems (MEMS)</td>
<td>10</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>(MEMS) (WMEE009-10)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Global Change (GC) (WMEE008-05)</td>
<td>5</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>
Optional courses offered by EES

Table 4. Overview of the optional courses offered by EES.

<table>
<thead>
<tr>
<th>Course unit</th>
<th>EC</th>
<th>Practical</th>
<th>Entry requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Climate Modelling (CM) (WMEE012-05)</td>
<td>5</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Conceptualizing and Modeling Human-Environmental Systems (WMEE011-05)</td>
<td>5</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Energy and Complexity Nexus (ECN) (WMEE18002)</td>
<td>5</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Experimental Methods of Trace Gas Research (EMTGR) (WMEE007-05) (only offered two-yearly; again in 2021-2022)</td>
<td>5</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Fuel Cell Systems (WMEE015-05)</td>
<td>5</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Nuclear Power Technology (WMEE014-05)*</td>
<td>5</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Radiocarbon Dating and Analysis (WMEE013-05)</td>
<td>5</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

*It is not allowed to choose Nuclear Power Technology if the student already passed the Nuclear Energy course in his Bachelor or Master’s degree programme at the UG.

Optional courses offered by other degree programmes

Students can select other elective courses from other degree programmes. For the number of EC, Practical, Entry requirements, see the course catalogue Ocasys. Table 5 gives an overview of possible optional courses.

Table 5. Overview of possible optional courses offered by other degree programmes

All 5 EC, unless another amount is mentioned.

Electives of other degree programmes in the Faculty of Science and Engineering

- WMBY018-06 Advanced Statistics
- WMCE001-05 Bio-based Products
- WMCH027-05 Biocatalysis and Green Chemistry
- WMIE018-05 Bioprocess Technology
- WBBY016-05 Conservation Biology**
- WMSE001-10 Introduction Science and Business
- WMSE002-10 Introduction Science and Policy
- WMMB008-05 Marine Ecosystem Service and Global Change
WMCH011-05  Photovoltaics Science and Energy**
WMPH027-05  Physics of Lasers
WMMB009-05  Polar Ecosystems
WBPH029-05  Principles of Measurement Systems***
WBCS033-05  C++ Fundamentals
WMEC006-05  Skills in Science Communication
WMPH030-05  Statistical methods in physics
WMIE021-05  Systems engineering
WMIE006-05  Technology Based Entrepreneurship
WMME018-05  Thermodynamics of Energy Conversion
WMPH040-05  Ultrafast Time-Resolved Spectroscopy
TEM0105      Basiscursus Master Lerarenopleiding
TEM0205      Masterstage 1

**It is not allowed to choose Conservation Biology when the student already passed this
course in his Bachelor degree programme at the UG.

***It is not allowed to choose Photovoltaics Science and Energy when the student already
passed Solar Cells in his Bachelor degree programme at the UG.

****It is not allowed to choose Principles of Measurement Systems when the student already
passed this course in his Bachelor degree programme at the UG.

Electives of Faculty of Economics and Business:
EBM148A05  Economics of Regulating Markets
EBM166A05  Energy & Finance
EBM167A05  Energy Transition & Innovation
EBM201A05  Global Supply Chain Man & Sustainability
EBM192A05  Marketing and Consumer Well-being
EBM202A05  Sustainable Energy Supply

Electives of Faculty of Spatial Sciences:
GEMDILEIP  Dilemmas in Infrastructure Planning
GEMREENVPL  Reinventing Environmental Planning
GEMSOCIMAS  Social Impact Assessment
GEMTRWATM  Transitions in Water Management
GEMIPS  Interdisciplinary perspectives on sustainability

Electives of Faculty of Behavioural and Social Sciences:
PSMSB-2  Environmental psychology
Appendix VI: Admission to the degree programme (art. 2.1.B)
Additional selection criteria, next to the entry requirements in article 2.1.A and 2.2.

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:

- Biology
- Life Science and Technology
- Biomedical Engineering
- Pharmacy
- Chemistry
- Chemical Engineering
- Physics
- Applied Physics
- Astronomy
- Mathematics
- Applied Mathematics
- Computing Science
- Industrial Engineering and Management Science
- Artificial Intelligence

Appendix VII Transitional provisions (art 7.1)
No provisions needed.

Appendix VIII
Application deadlines for admission (art. 2.6.1)
Starting date 1 September 2021

<table>
<thead>
<tr>
<th>Deadline of Application</th>
<th>Non-EU students</th>
<th>EU students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy and Environmental Sciences</td>
<td>May 1st 2021</td>
<td>May 1st 2021</td>
</tr>
</tbody>
</table>

Decision deadlines (art. 2.6.3)

<table>
<thead>
<tr>
<th>Deadline of Decision</th>
<th>Non-EU students</th>
<th>EU students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy and Environmental Sciences</td>
<td>June 1st 2021</td>
<td>June 1st 2021</td>
</tr>
</tbody>
</table>