

# **Teaching and Examination Regulations**

MASTER's Degree Programme

B. Programme-specific section

**M Earth Sciences**

Academic year 2016-2017

## **Section B: Programme-specific section**

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**Section B: Programme-specific section****1. General provisions****Article 1.1 Definitions**

In addition to the definitions as laid down in article 1 of TER part A, the following abbreviations are also used in TER part B:

ESPCaR	Earth Surface Processes, Climate and Records. A specialization in the MSc Earth Sciences that results from a merger between the former specializations Applied Environmental Geosciences (AEG) and Palaeoclimate and Geo-ecosystems (PG)
ES&E	Earth Sciences and Economics – specialization in the MSc Earth Sciences
G&G	Geology and Geochemistry. A specialization in the MSc Earth Sciences, focusing on the Earth's interior, geology, and geochemistry

<b>Examination</b>	<b>Abbr.</b>
<i>Exam</i>	E
<i>Report, essay</i>	R
<i>Presentation</i>	Pres
<i>Practical</i>	Prac
<i>Assignment</i>	A
<i>Field Work</i>	FW

<b>Teaching method</b>	<b>Abbr.</b>
<i>Lecture</i>	HC
<i>Seminar</i>	WC
<i>Study group</i>	WG
<i>Computer Lab</i>	CPR
<i>Practical</i>	PR
<i>Field Work</i>	VW
<i>Excursion</i>	EXC
<i>Training</i>	TR

**Article 1.2 Degree programme information**

- The Msc Earth Sciences, CROHO number 66986, is offered on a full-time basis and the language of instruction is English.
- The programme has a workload of 120 EC.
- A unit of study comprises 6 EC or a multiple thereof. The units of study listed below have a different size:

<b>Code</b>	<b>Naam</b>	<b>EC</b>
AM_1012	Hydrological Systems and Water Managem.	3
AM_1149	Research Project ESPCaR	27
AM_1186	Master Thesis Geology and Geochemistry	27
AM_1187	Research Project G&G	27
AM_450058	Sediment Petrography of Heavy Minerals	3
AM_450061	Volcanism	3
AM_450164	Precambrian Geology	3
AM_450169	Diagenesis of Sedimentary Rocks	3
AM_450171	Advanced Geochronology	3

AM_450172	Advanced Inorganic Geochemistry	3
AM_450179	Petroleum Systems and Regional Geology	3
AM_450187	Man and Climate	3
AM_450225	Mantle Properties	3
AM_450229	Introduction Field Excursion	3
AM_450317	Petroleum Geology of the North Sea	6
AM_450354	Scotland Excursion	3

4. In rare cases units of study comprise deviating numbers of EC due to courses being offered at other Dutch universities with their own rules for the size of units of study.

#### Article 1.3 Intake dates

The programme is offered starting in the first semester of the academic year.

The single intake date ensure(s) that the programme can be completed within the nominal study duration set for the programme.

## 2. Programme objectives and exit qualifications

#### Article 2.1 Programme objective

The objective of the programme is to educate a graduate so that he or she:

1. Has specific and fundamental theoretical and practical knowledge of Earth science processes, notably within his/her field of specialization, as a basis for predicting the further course of processes, including the role of mankind now and in the future. Insight into Earth processes requires further deepening of basic knowledge, understanding of a broad spectrum of spatial and temporal scales and an approach focusing on the interaction by and between the various Earth domains.
2. Has experience in carrying out research independently. This experience is gradually developed within the programme through exposure to research and interaction with active researchers and, ultimately, through active participation in research. This occurs in such a way that it allows the student to consciously decide whether he/she prefers to continue his/her studies in order to obtain a PhD degree or to take up a position outside the academic world.
3. Functions in his/her discipline at an academic level, both mentally and in daily practice; the programme stimulates the social and personal development of the student by motivating societal awareness, independence, communicative behaviour and co-operation.
4. Recognizes the need to continue his/her education by following relevant developments within the field of Earth sciences to maintain a state-of-the-art knowledge basis, and is prepared to realize this.
5. Is able to start and successfully complete a PhD thesis or to successfully compete in the (inter-) national labour market for positions at an academic level with government or government-related institutions, private companies, or elsewhere.
6. Has insight into the broad historical, philosophical and social context of the discipline and aspects concerning the intellectual integrity and moral and ethical dimensions of scientific research and its applications.

#### Article 2.2 Exit qualifications

The objectives listed in the Programme Objectives (Article 2.1) have been translated into final exit qualifications of the MSc Earth Sciences programme in relation to Dublin descriptors. The exit qualification levels are listed below:

### **Dublin descriptor 1: Knowledge and insights**

*The graduate has demonstrated knowledge and insights in a field of study that builds upon their general secondary and bachelor education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects of knowledge at the forefront of their field of study.*

#### **General**

The student has a basic understanding of the theory and scientific principles behind the theme or techniques taught, and an appreciation of when and how it can be appropriately used or applied. Depending on the track followed the graduate has:

#### **(1) Earth Surface Processes, Climate and Records (ESPCaR)**

- a substantial knowledge of climate systems that operated both in the past and at present, and the interactions of the different components of the climate system;
- knowledge of the different components (ice, atmosphere, land and oceans) of the climate regime and their properties and how they interact;
- knowledge of changes that (presently) occur at the earth surface and the interaction with climate and environmental variation at different spatial and temporal scales;
- understanding of the processes that regulate the transfer of energy, water and trace gases between the land surface and the atmosphere;
- good theoretical understanding of mathematics, physics, chemistry and statistics in relation to geo-environmental sciences.
- knowledge of the proxies employed in palaeoclimate and geo-ecosystem research.
- knowledge of hydrology and/or Geographical Information Science, Remote Sensing techniques;
- profound knowledge of the methods applied in environmental geosciences.

#### **(2) Earth Sciences and Economics (ES&E)**

- basic knowledge of basin assessment
- a profound knowledge of economic principles on spatial policy making and landscape assessment
- good theoretical understanding of Geographical Information Science, Remote Sensing and Decision Making techniques
- Depending on the focus of elective courses in this track, the graduate has profound knowledge of:
  - climate systems and their interaction to geo-ecological systems, man, policy making and spatial economics, and/or;
  - the water cycle interacting with the elements of ecosystem functioning, land use, spatial economics and policy, and/or;
  - energy systems, especially geothermal, its policy implications and spatial economics.

#### **(3) Geology and Geochemistry (G&G)**

- a regional knowledge of worldwide geological systems and their settings;
- knowledge of relationships between geological processes in Earth's interior (subduction, metamorphism, magmatism) and related surface expressions and sedimentary sequences;
- knowledge of processes of heat transport and fluid flow, and large scale mountain building and lithosphere deformation;
- knowledge of interpretation techniques of subsurface geophysical and geological data;

### **Dublin descriptor 2: Applying knowledge and insight in practice**

*The graduate can apply his/her knowledge and insight in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study.*

#### **General**

The student has achieved a deep enough knowledge of themes or techniques that (s)he can demonstrate that (s)he is in a position to apply them. In essence it means that this particular theme or group of themes will lie in the student's specialist direction.

The graduate is able to:

- formulate a problem based on raw data and/or data from a literature study and design a sound, scientific, approach for researching and solving the problem;
- formulate a research proposal, which includes the problem formulation, the hypotheses, the proposed execution and the finalization of the project;
- develop (conceptual) models suited for the testing of hypotheses and to give explanations;
- collect and critically compile the literature significant to a specific topic to be studied;
- operate within a multidisciplinary framework and to connect different types of factual information.

(1) Earth Surface Processes, Climate and Records (ESPCaR)

- unravel a sedimentary archive embedding climate and palaeo-environmental signals, by employing an array of techniques;
- translate and quantify ongoing processes at the land surface that generate climate change into changing boundary conditions for climate modelling;
- discern the various physical and biogeochemical processes that contribute to (future) climate change and their impact on sustainability;
- use his/hers knowledge and insights in the political debate on the role that future climate developments play.
- perform environmental analyses and reconstructions.

(2) Earth Sciences and Economics (ES&E)

- apply and understand economic evaluation tools for policy assessment, e.g. CBA and MCA;
- apply GIS, RS and decision making techniques on relevant Earth-Sciences-and-Economics problems, and understand the interactions at the disciplinary interfaces;
- bridge the gap between industry, academia, government agencies and NGO's in dealing with resource and water management, risk assessment, land use and ecosystem services;
- understand the positions in the political debate on the management of natural resources, water and landscape.

(3) Geology and Geochemistry (G&G)

- apply fieldwork skills, i.e. linking theoretical knowledge and factual information to field observations;
- apply analogue and/or numerical modelling and/or laboratory techniques associated with the subject of specialization.

**Dublin descriptor 3: Critical judgement**

*The graduate has the ability to gather and interpret relevant data (usually within their field of study) to inform judgements that include reflection on relevant social, scientific or ethical issues.*

The graduate:

- understands professional literature and can judge its quality and usefulness for own research;
- is able to determine independently which data or methods are required to obtain a specific result (or to finish a project);
- has an understanding of the subject area's limits, i.e. realize that at a certain stage other expertise should be brought in, or that there is a need for interdisciplinary co-operation;
- has an understanding of his/her personal stronger and weaker points, affinities, development potential and preferences in relation to the discipline chosen and the related professional potential;
- is able to consciously decide whether he/she prefers to continue his/her studies in order to obtain a PhD degree or to take up a position outside the academic world;
- is able to recognize and to judge ethical aspects of science and of the application of science.

#### **Dublin descriptor 4: Communication**

*The graduate can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences.*

The graduate is able:

- to complete a report on trainee work, subject matter studied, or research carried out, that meets the requirements of an international scientific journal;
- to clearly present information, both written and orally to a public of specialists from the same subject area, on a topic that was independently studied (in English);
- to read publications and reports in his/her native language and in English;
- to contribute in international scientific forums;
- to actively and constructively participate in discussions and meetings;
- to operate individually as well as to co-operate in small international and multidisciplinary working groups at a level that is at the frontier of the subject area of study;
- to apply her/his knowledge in such a way that it demonstrates a professional attitude towards her/his work or profession.

#### **Dublin descriptor 5: Learning skills**

*The graduate has developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy*

The graduate has developed skills:

- to independently collect and to critically compile the literature significant to a specific topic to be studied;
- to use modern techniques to keep his/her knowledge up-to-date;
- to read and understand the specialization's specific journals, as well as the more general natural sciences journals such as Nature and Science;
- to recognize the need to continue his/her education (the graduate is aware of the need to keep in touch with relevant developments within his/her discipline, and is prepared to realize this);
- to be able to get acquainted with one of the other specializations within the subject area in the course of a few months;
- to be able to get acquainted within a reasonable time with a subject area within the discipline which is different from the one of the degree programme.

### **3. Further admission requirements**

#### **Article 3.1 Admission requirements**

1. Admission to the Master's programme is possible for an individual who can demonstrate that he/she has the following knowledge, understanding and skills at the Bachelor's degree level, obtained at an institution of academic higher education:
  - a. knowledge: natural sciences (mathematics, physics, and chemistry) and earth sciences (BSc level geology/geochemistry/geophysics)
  - b. understanding: common processes in earth sciences
  - c. skills: general academic skills including analytical and critical thinking; English language skills; scientific writing skills as demonstrated by a BSc thesis or equivalent
2. The Admissions Board will investigate whether the interested person meets the admission requirements.
3. In addition to the requirements referred to in the first paragraph, the Board will also assess requests for admission in terms of the following criteria:
  - a. talent and motivation;
  - b. proficiency in relevant methods and techniques
4. Any individual who has obtained a Bachelor's degree in academic higher education on the degree programme Earth Sciences at the VU meets the requirements referred to in paragraph 1.
5. The following additional admission requirements for students with a Bachelor of Science degree in Earth Sciences (Aardwetenschappen) from Vrije Universiteit Amsterdam apply to specific specializations within the Master Earth Sciences:
  - a. Students who have successfully completed the Bachelor's degree examinations in Earth Sciences (specialization/afstudeerrichting Solid Earth/Vaste Aarde) will be

- admitted to the specializations ESPCaR, SE, Science Communication (C variant) and Education (E variant)
- b. Students who have successfully completed the Bachelor's degree examinations in Earth Sciences (specialization/afstudeerrichting Earth Surface/Aardoppervlak) will be admitted to the specializations ESPCaR, Science communication (C variant), Education (E variant).
  - c. Students who have successfully completed the Bachelor's degree examinations in Earth Sciences and Economics ('Aarde en Economie') will be admitted to the specialization ES&E
  - d. Students who have successfully completed the Bachelor's degree examinations in Earth Sciences and Economics ('Aarde en Economie'), including the minor Earth Surface (Aardoppervlak) will be admitted to the specialization ESPCaR
  - e. Students who have successfully completed the Bachelor's degree examinations in Earth Sciences and Economics ('Aarde en Economie'), including the component 'Sociale geografie I' (AB\_450099), will be admitted to the specialization Education (E-variant)
  - f. Students who do not receive direct admission to a given specialization within the Master Earth Sciences based on their Bachelor's degree variant can still be admitted to the Master's programme in question on the grounds of a decision to that effect taken by the Admission Board of the Master. In taking this decision, the Admission Board will specify the specialization within the Master Earth Sciences to which the student in question is admitted. The Admission Board may make additional demands of the student before granting admission to the Master.
6. Students who hold a Bachelor's degree in Earth Sciences from a Dutch university other than the Vrije Universiteit Amsterdam may be admitted to the Master Earth Sciences at Vrije Universiteit Amsterdam on the basis of a decision to that effect taken by the Admission Board of the Master. In taking this decision, the Admission Board will specify the specialization within the Master Earth Sciences to which the student in question is admitted. The Admission Board may make additional demands of the student before granting admission to the Master.
  7. Students who hold a Bachelor's degree in a science or technical subject from a Dutch university may be admitted to the Master Earth Sciences at Vrije Universiteit Amsterdam on the basis of a decision to that effect taken by the Admission Board of the Master. The Admission Board will determine whether the Bachelor's programme completed by the candidate is sufficiently relevant to warrant admission to the Master Earth Sciences and will specify the specialization within the Master in Earth Sciences to which the candidate is admitted. The Admission Board may make additional demands of the student before granting admission to the Master's programme.
  8. Students who hold a certificate obtained from a university of applied sciences (HBO diploma) in the Netherlands may be admitted to the Master Earth Sciences at Vrije Universiteit Amsterdam on the basis of a decision to that effect taken by the Admission Board of the Master. The Admission Board will determine whether the programme of higher vocational education completed by the candidate is sufficiently relevant to warrant admission to the Master Earth Sciences and will specify the specialization within the Master Earth Sciences to which the candidate is admitted. The Admission Board may make additional demands of the student before granting admission to the Master's programme.
  9. Students who hold an equivalent qualification from an institution outside of the Netherlands may be admitted to the Master Earth Sciences at Vrije Universiteit Amsterdam on the basis of a decision to that effect taken by the Admission Board of the Master. In taking this decision, the Admission Board will specify the specialization within the Master Earth Sciences to which the student in question is admitted. The Admission Board may make additional demands of the student before granting admission to the Master's programme.
  10. When the programme commences, the candidate must have fully completed the Bachelor's programme or pre-Master's programme allowing admission to this Master's programme.

### [Article 3.2](#)    [Pre-Master's programme](#)

The MSc Earth Sciences has no predefined pre-master programme

### [Article 3.3](#)    [Limited programme capacity](#)

Not applicable

#### Article 3.4 Final deadline for registration

A candidate must submit a request to be admitted to the programme through Studielink before 1 June in the case of Dutch students, before 1 April in the case of EU students and before 1 February in the case of non-EU students. Under exceptional circumstances, the Examinations Board may consider a request submitted after this closing date.

#### Article 3.5 English language requirement for English-language Master's programmes

1. The proficiency requirement in English as the language of instruction can be met by the successful completion of one of the following examinations or an equivalent:
  - IELTS: 6.5
  - TOEFL paper based test: 580
  - TOEFL internet based test: 92-93
  - Cambridge Advanced English: A, B or C.
2. Exemption is granted from the examination in English referred to in the first paragraph to students who, within two years before the start of the programme:
  - met the requirements of the VU test in English language proficiency TOEFL ITP, with at least the scores specified in paragraph 1, or
  - had previous education in secondary or tertiary education in an English-speaking country as listed on the VU website, or
  - have an English-language 'international baccalaureate' diploma

#### Article 3.6 Free curriculum

1. Subject to certain conditions, the student has the option of compiling a curriculum of his/her own choice which deviates from the curricula prescribed by the programme.
2. The concrete details of such a curriculum must be approved beforehand by the Examination Board.
3. The free curriculum is put together by the student from the units of study offered by Vrije Universiteit Amsterdam or another institution of higher education and must at least have the size, breadth and depth of a regular Master's programme.
4. The following conditions must at least have been met in order to be eligible for the Master's degree:
  - a. at least 60 EC must be obtained from the regular curriculum,
  - b. the level of the programme must match the objectives and exit qualifications that apply for the programme for which the student is enrolled.

### 4. Curriculum structure

#### Article 4.1 Composition of programme

1. The programme consists of the following components:
  - a. compulsory units of study
  - b. electives
2. The programme offers five specializations:
  - I. Research specializations
    - a) Earth Surface Processes, Climate and Records (ESPCaR)
    - b) Earth Sciences and Economics (ES&E)
    - c) Geology and Geochemistry (G&G)
  - II. Education specialization (E variant)
  - III. Science communication specialization (C variant)

The compulsory parts of these specializations are listed in Article 4.2. The electives of these specializations are listed in Article 4.4.

**Article 4.2 Compulsory units of study**

Abbreviations of teaching method and examination format are defined in Article 1.1.

**I. Research specializations****1. Earth Surface Processes, Climate and Records (ESPCaR), with 96 EC in compulsory courses**

The compulsory units of study are:

Course code	Name	EC	Period	Teaching Method	Examination format	Level
AM_1124	Modern Climate and Geo-ecosystems	6	1	EXC, WC	E, R	400
AM_1144	Practical: Paleoclimate Change	6	4	EXC, PR, WG	R, Pres, Prac	400
AM_1147	Master Thesis ESPCaR**	24	Ac. Jaar		R, Pres	600
AM_1149	Research Project ESPCaR	27	Ac. Jaar		R, Pres	600
AM_1197	Advanced Spatial Analysis***	6				500
AM_450146	Tectonic Geomorphology	6	2	WC, CPR	E, R, Pres	400
	Sedimentary Environments and Climate					
AM_450330	Ar.	6	1	EXC, WC	E, R	400
AM_450331	High Resolution Archives	6	2	WC, CPR	R	400
AM_450332	Global Biogeochemical Cycles	6	4	CPR, HC	E, R	400
AM_450354	Scotland Excursion*	3		VW	Pres	400

\* Taught every other year, next excursion in 2017-2018

\*\* Extension is possible by at most 12 EC and only with the (prior) permission of the Examination Board

\*\*\* Course will be first offered for students of ESPCAR in 2017-2018

In addition, this specialization has the following restricted options (6 EC required):

**AM\_ES-  
ESPVK**

Choose one of these courses

Course code	Name	EC	Period	Teaching Method	Examination format	Level
AM_450004	Climate Modelling	6	3	WC, CPR	E, A, Pres	400
AM_450145	Environmental Remote Sensing	6	3	WC, CPR	E	400

**2. Earth Sciences and Economics (ES&E), with 84 EC in compulsory courses****AM\_ESE-V Compulsory courses**

Course code	Name	EC	Period	Teaching Method	Examination format	Level
AM_1103	Research Project ES&E	18	Ac. Jaar		R	400
AM_1150	Master Thesis ES&E	24	3+4+5+6		R, Pres	500
AM_1183	Imaging and Assessing Landscapes	6	4	EXC, CPR, HC	E, A	400
AM_450400	Microec. Foundation of Spatial Policy	6	1	WG, HC	E, A	400
AM_450401	Empirical Methods for Spatial Policy	6	2	WG, HC	E, Pres	400
AM_450402	Decision Making Processes	6	2	WC	A, Prac	400
AM_450405	Exploring Earth Processes and Resources	6	4	WC, CPR	E, R, Pres	400
AM_450406	Project Environmental Impact Assessment	6	3	EXC, WC, CPR	A, R, Pres	400
AM_468023	Water Management	6	1	CPR, HC	E, R	400

i) In addition, this specialization has the following restricted options:

**AM\_ESE-VK1**

Choose one of these courses

Course code	Name	EC	Period	Teaching Method	Examination format	Level
AM_450409	Geothermal Energy	6		CPR, HC	A, R, Pres	500
E_STR_ECC	Economics of Climate Change 4.4	6	4	HC		400

ii) Students should select at least 6 EC of the following Earth Science oriented course components, and at least 6 EC of the following Economics oriented course components

**AM\_ESE-VK2 ES oriented courses, choose 6 EC**

Course code	Name	EC	Period	Teaching Method	Examination format	Level
AM_1124	Modern Climate and Geo-ecosystems	6	1	EXC, WC	E, R	400
AM_450014	Ecohydrology	6	1	WC, CPR	E, Pres	400
AM_450408	Petroleum Systems (ES and E)	6	1	CPR, HC	R	400
AM_450409	Geothermal Energy	6		CPR, HC	A, R, Pres	500

**EC oriented courses, choose 6 EC**

**AM\_ESE-VK3**

Course code	Name	EC	Period	Teaching Method	Examination format	Level
E_STR_ECC	Economics of Climate Change 4.4	6	4	HC		400
E_STR_EEC	Env Economics 4.2	6	2	HC		400
E_STR_RUE	Reg & Urb Ec 4.2	6	2	HC		400
E_STR_TREC	Transp Ec 4.4	6	4	HC		400

iii) Students should select another 18 EC from the courses listed under both ii) above and the following list:

**AM\_ESE-VK4 Choose 18 EC of these courses**

Course code	Name	EC	Period	Teaching Method	Examination format	Level
AM_1155	Energy Governance	6	3	WC		400
AM_1197	Advanced Spatial Analyses	6	2			500
AM_450170	Reflection Seismic for Geologists	6	4	WC, CPR	E, A	500
AM_450187	Man and Climate	3		WC	E, Pres	500
AM_450188	Climate and Policy	6	3	WC		400
AM_450330	Sedimentary Environments and Climate					
AM_450330	Ar.	6	1	EXC, WC	E, R	400
AM_468018	Sustainable Energy Analysis	6	1	WC, HC	E, Pres	400
AM_470502	Spatial Ecology and Global Change	6		EXC, HC		
AMU_0009	Spatial Processes in Ecology	6				
AMU_0010	Building Bridges between S&S	6				
AMU_0011	Ecosystem Management	6				
AMU_0012	Field Course Geo-Ecological Systems	12				
AMU_0013	Integrated Coastal and Dune Man.	6				
AMU_0014	Soil and Landscape Degradation	6				
AMU_0015	System Innovation and Trans. Man.	6				
AMU_0021	Biological Oceanography	6	2		E, R, Pres	500

**3. Geology and Geochemistry (G&G), with 81 EC in compulsory courses****Compulsory courses- Geology and Geochem.****AM\_ES-GG-V**

Course code	Name	EC	Period	Teaching Method	Examination format	Level
AM_1186	Master Thesis Geology and Geochemistry*	27	Ac. Jaar		R, Pres	600
AM_1187	Research Project G&G	27	Ac. Jaar		R, Pres	600
AM_450146	From Source to Sink	6	2	WC, CPR	E, R, Pres	400
AM_450154	Sedimentary Basins	6	2	CPR, HC	E, Prac	400
AM_450179	Petroleum Systems and Regional Geology	3	1	WC	R	400
AM_450190	Orogenesis	6	3	WC, CPR	E, R, Pres	400
AM_450225	Mantle Properties	3	1	WC	E, A, R, Pres	400
AM_450229	Introduction Field Excursion	3	1	VW	E, R, Pres	400

\* Extension is possible by at most 12 EC and only with the (prior) permission of the Examination Board

**II Education**

i) Earth Sciences content (60 EC)

*Specialisation ESPCaR or G&G*

**AM\_ES-EDfalw Earth Sciences specific content**

Course code	Name	EC	Period	Teaching Method	Examination format	Level
AM_1051	Sociale geografie II	12	Ac. Jaar	WC	T, V	400
AM_1149 or AM_450200	Research Project from one of the specialisations	27	Ac. Jaar			
	Compulsory Course from same specialization as chosen research project	12				
	Earth Science electives (Article 4.4)	9				

*Specialisation ES&E*

Course code	Name	EC	Period	Teaching Method	Examination format	Level
AM_1051	Sociale geografie II	12	Ac. Jaar	WC	T, V	400
AM_1103	Research Project Earth Sciences and Economics	18	Ac. Jaar			
	Compulsory Course from same specialization as chosen research project	12				

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## ii) Educational content (60 EC).

## Compulsory units of the specialization

<b>AM2_ES-EDU</b>		<b>Education specific content, 60 EC required</b>			<b>Examination format</b>	<b>Level</b>
<b>Course code</b>	<b>Name</b>	<b>EC</b>	<b>Period</b>	<b>Teaching Method</b>		
OM1_LAK15	Master Leraar VHO Aardrijkskunde					
O_MFDIDAC_1	Didactiek 1	6	4	WG, HC		400
O_MFDIDAC_2	Didactiek 2	6	5+6	WG, HC		400
O_MFDIDAC_3	Didactiek 3	9	1+2+3	HC		
O_MFPRAK_1	Praktijk 1	6	4	WG		400
O_MFPRAK_2	Praktijk 2	9	5+6			400
O_MFPRAK_3	Praktijk 3	15	1+2+3	WG		400
O_MFPROZ_1	Praktijkonderzoek 1	3	6	HC, WG		
O_MFPROZ_2	Praktijkonderzoek 2	6	1+2+3	WC, HC		
O_MLDIDAC_1	Didactiek 1	6	1	WG, HC		400
O_MLDIDAC_2	Didactiek 2	6	2+3	HC, WG		400
O_MLDIDAC_3	Didactiek 3	9	4+5+6	WG, HC		400
			1+2+3,			
O_MLPEERGR_1	Peergroup 1		4+5+6	WG		400
O_MLPEERGR_2	Peergroup 2		3+4+5	WG		
O_MLPRAK_1	Praktijk 1	6	1	WG		400
O_MLPRAK_2	Praktijk 2	9	2+3	WG		400
O_MLPRAK_3	Praktijk 3	15	4+5+6			400
O_MLPROZ_1	Praktijkonderzoek 1	3	3	HC, WG		400
O_MLPROZ_2	Praktijkonderzoek 2	6	4+5+6	WC, HC		400

If the student is exempted for parts of the specialisation in Education, the exempted EC have to be compensated with other mastercourses of the programme.

If the student wishes to take a different course than the units of study listed, advance permission must be obtained in writing from the Examinations Board.

## III. Science Communication

## i) Earth Sciences content (60 EC)

*Specialisation ESPCaR or SE*

<b>Course code</b>	<b>Name</b>	<b>EC</b>	<b>Period</b>	<b>Teaching Method</b>	<b>Examination format</b>	<b>Level</b>
AM_1149 or AM_1187	Research Project from one of the specialisations	27	Ac. Jaar			
	Compulsory Course from same specialization as chosen research project	12				
	Earth Science electives (Article 4.4)	9				

*Specialisation ES&E*

<b>Course code</b>	<b>Name</b>	<b>EC</b>	<b>Period</b>	<b>Teaching Method</b>	<b>Examination format</b>	<b>Level</b>
AM_1103	Research Project Earth Sciences and Economics	18	Ac. Jaar			
	Compulsory Course from same specialization as chosen research project	21				
	Earth Science electives (Article 4.4)	21				

## ii) Science Communication content compulsory courses (42 EC)

<b>AM_ES-SC-V</b>		<b>Compulsory components Science Communic.</b>			<b>Examination format</b>	<b>Level</b>
<b>Course code</b>	<b>Name</b>	<b>EC</b>	<b>Period</b>	<b>Teaching Method</b>		
AM_470587	Science and Communication	6	1	WG, HC	E, A	500
AM_1182	Research methods for analyzing complex problems	6	1		E, A	400
AM_BMEDCSvki	Choose one of these courses					
AM_1162	Research Internship Science Comm.	30	Ac. Jaar		R, Pres	600
AM_1163	Reflective Practice Int. SC. Comm.	30	Ac. Jaar		R, Pres	600
AM_ES-SC-K	Science Communication Restricted electives (18 EC required)					
AM_1002	Science in Dialogue	6	2	WC, HC, WG	E, A, R	500
AM_470572	Communication, Org. and Management	6	2	WG, HC	E, A	500

AM_470590	Science Museology	6	3	VW, WC, WG, HC	A, Pres	500
AM_471014	Science Journalism	6	2	CPR, WG, HC	A	500

#### Article 4.3 Practical exercise

Except for those practical components incorporated in the compulsory units of study above and in relevant electives, the programme has no separate practical exercise.

#### Article 4.4 Electives

The student can take the following electives:

<b>Elective courses MSc Earth Sciences</b>							
<b>AM_ES-K</b>	<b>Course code</b>	<b>Name</b>	<b>EC</b>	<b>Period</b>	<b>Teaching Method</b>	<b>Examination format</b>	<b>Level</b>
	AM_1049	Causes and Consequences of Environm. Ch.	6	1	CPR, WG, HC	E, A, Pres	400
	AM_1051	Sociale geografie II	12		WC	T, V	400
	AM_1124	Modern Climate and Geo-ecosystems	6	1	EXC, WC	E, R	400
	AM_1144	Practical: Paleoclimate Change	6	4	EXC, PR, WG	R, Pres, Prac	
	AM_1173	Advanced Tectonics	6	5	WC		400
	AM_1174	Capita Selecta Geology and Geochemistry	6	4	WC	R, Pres	400
	AM_450003	Catchment Response Analysis	6	1	WC, CPR	E, R	400
	AM_450004	Climate Modelling	6	3	WC, CPR	E, A, Pres	400
	AM_450014	Ecohydrology	6	1	WC, CPR	E, Pres	400
	AM_450021	Unsaturated Zone Hydrological Processes	6	2	WC, CPR		400
	AM_450058	Sediment Petrography of Heavy Minerals	3		WC	E, Pres	400
	AM_450061	Volcanism	3	3	WC, CPR	E, A	500
	AM_450132	Geomicrobiology	6	Ac. Jaar			400
	AM_450145	Environmental Remote Sensing	6		WC, CPR	E	400
	AM_450164	Precambrian Geology	3	4	WC	R, Pres	500
	AM_450169	Diagenesis of Sedimentary Rocks	3	5	WC, CPR, PR	E, R	500
	AM_450170	Reflection Seismic for Geologists	6	4	WC, CPR	E, A	500
	AM_450171	Advanced Geochronology	3	5	WC	R, Pres	500
	AM_450172	Advanced Inorganic Geochemistry	3	5	WG	R, Pres	500
	AM_450176	Metamorphism and P-T Evolution	6	4	WC	E, A, R, Pres	500
	AM_450187	Man and Climate	3		WC	E, Pres	500
	AM_450188	Climate and Policy	6	3	WC		400
	AM_450189	Magmatic Processes	6	4	WC	E, A, R, Pres	500
	AM_450273	Planetary Science	6	1+2	WC	E, Pres	500
	AM_450316	3D Seismic Interpretation and Geology	6	1	WC	E, A, Pres	400
	AM_450317	Petroleum Geology of the North Sea	7	2	HC	E, A, Pres	500
	AM_450330	Sedimentary Environments and Climate Ar.	6	1	EXC, WC	E, R	400
	AM_450332	Global Biogeochemical Cycles	6	4	CPR, HC	E, R	400
	AM_450409	Geothermal Energy	6		CPR, HC	A, R, Pres	500
	AM_468018	Sustainable Energy Analysis	6	1	WC, HC	E, Pres	400
	AM_470587	Science and Communication	6	1	WG, HC	E, A	500
	AM_471014	Science Journalism	6	2	CPR, WG, HC	A	500
	AM_1197	Advanced Spatial Analyses	6	2			500
	AMU_0021	Biological Oceanography	6	2			500
	AM_1183	Imaging and assessing landscape	6	4			400

If the student wishes to take a different course than the units of study listed, advance permission must be obtained in writing from the Examinations Board.]

#### Article 4.5 Sequence of examinations

1. Students may participate in examinations for the units listed below only if they have passed the examination or examinations for the units mentioned.
2. On the grounds of a motivated request by the student, the Examination Board may grant an exemption to the conditions stipulated in Article 4.5.1 of these regulations

<i>Course code</i>	<i>Subject</i>	<i>entry requirements</i>
AM_1147	Master Thesis Earth Surface Processes, Climate and Records	registration of at least 36 EC of the specialization concerned , and the Research project report must have been submitted

AM_1150	Master Thesis Earth Sciences and Economics	registration of at least 36 EC of the specialization concerned
AM_1186	Master Thesis Geology and Geochemistry	registration of at least 36 EC of the specialization concerned
AM_450170	Reflection Seismics	AM_450179 Petroleum Systems and Regional Geology
AM_1103	Research Project Earth Sciences and Economics	registration of at least 18 EC of the specialization concerned
AM_1149	Research Project ESPCaR	registration of at least 18 EC of the specialization concerned
AM_1185	Research Project Geology and Geochemistry	registration of at least 18 EC of the specialization concerned

#### Article 4.6 Participation in practical exercise and tutorials

1. In the case of a practical training, the student must attend 100 % of the practical sessions. Should the student attend less than 100 %, he/she must repeat the practical training, or the examiner may issue one or more supplementary assignments.
2. In the case of tutorials with assignments, the student must attend 100 % of the tutorials. Should the student attend less than 100 %, he/she must repeat the study group, or the Examinations Board may have one or more supplementary assignments issued.
3. In exceptional circumstances, the Examinations Board may, at the request of the student, permit an exemption from this requirement if, in the opinion of the Board, the assessment of the intended skills is also possible with a lesser percentage of participation, with or without the imposition of supplementary requirements.

#### Article 4.7 Maximum exemption

A maximum of 40 EC of the curriculum can be accumulated through granted exemptions.

#### Article 4.8 Validity period for results

As laid down in article 4.8 of TER part A.

#### Article 4.9 Degree

Students who have successfully completed their Master's final examination are awarded a Master of Science degree. The degree awarded is stated on the diploma. If it is a joint degree, this will also be stated on the diploma.

## 5. Transitional and final provisions

#### Article 5.1 Amendments and periodic review

1. Any amendment to the Teaching and Examination Regulations will be adopted by the faculty board after taking advice from the relevant Board of Studies. A copy of the advice will be sent to the authorized representative advisory body.
2. An amendment to the Teaching and Examination Regulations requires the approval of the authorized representative advisory body if it concerns components not related to the subjects of Section 7.13, paragraph 2 sub a to g and v of the WHW and the requirements for admission to the Master's programme.
3. An amendment to the Teaching and Examination Regulations can only pertain to an academic year that is already in progress if this does not demonstrably damage the interests of students.

#### Article 5.2 Transitional provisions

Notwithstanding the current Teaching and Examination Regulations, the following transitional provisions apply for students who started the programme under a previous set of Teaching and Examination Regulations:

1. **Specializations replaced in academic year 2016-2017**  
The specialization *Solid Earth* has been replaced by specialization *Geology and Geochemistry*
2. **Compulsory components replaced in academic year 2016-2017**
3. The compulsory components below have been replaced in academic year 2016-2017

New: Advanced Spatial Analyses (6 ec, AM\_1197)      Former: Basics in GIS (3 ec, AM\_450226)

4.

#### 5. Compulsory components replaced in academic year 2015-2016

The compulsory components below have been replaced in academic year 2015-2016

New component(s)	Former component(s)
AM_1185 Research Project Geology and Geochemistry	AM_450200 Research Project Solid Earth (27 EC)
AM_1186 Master Thesis Geology and Geochemistry	AM_450199 Master Thesis Solid Earth (27 EC)
AM_1183 Imaging and Assessing Landscapes (6 EC)	AM_450403 Imaging the Earth Surface (3 EC) and AM_450404 Assessing the Landscape (3 EC)
Research Internship Science Communication (30 EC) <i>or</i> Reflective Practice Internship Science Communication (30 EC)	Research Project Science Communication (21 EC) <i>and</i> Literature Study Science Communication (9 EC)
Praktijk 1, O_MLPRAK_1, 6 EC Praktijk 2, O_MLPRAK_2, 9 EC Praktijk 3, O_MLPRAK_3, 15 EC Didactiek 1, O_MLDIDAC_1, 6 EC Didactiek 2, O_MLDIDAC_2, 6 EC Didactiek 3, O_MLDIDAC_3, 6 EC Praktijk onderzoek 1, O_MLPROZ_1, 3 EC Praktijk onderzoek 2, O_MLPROZ_2, 6 EC	Algemene Didactiek en Pedagogiek I Algemene Didactiek en Pedagogiek II Praktijk I Praktijk II Vakdidactiek aardrijkskunde I Vakdidactiek aardrijkskunde II Professionele Ontwikkeling en Onderzoek I Professionele Ontwikkeling en Onderzoek II Verdieping

#### 6. Compulsory components replaced in academic year 2014-2015

The compulsory components below have been replaced in academic year 2014-2015

New component	Former component
AM_1124 Modern Climate and Geo-ecosystems (6 EC)	AM_450185 Modern Climate Systems (3 EC) and AM_450313 Modern Geo-ecosystems (3 EC)
AM_1144 Practical Paleoclimate Change and Environmental Impacts (6 EC)	AM_450266 Practical Paleoclimate Change and Environmental Impacts (3 EC) and AM_450054 Paleocology/palynology (3 EC)
AM_1149 Research Project ESPCaR (27 EC)	AM_450267 Research Project Applied Environmental Geosciences (24 EC)
AM_1149 Research Project ESPCaR (27 EC)	AM_450202 Research Project Palaeoclimate and Geo-ecosystems (27 EC)
AM_1147 Master Thesis ESPCaR (24 EC)*	AM_450268 Master Thesis Applied Environmental Geosciences (27 EC)
AM_1147 Master Thesis ESPCaR (24 EC)*	AM_450201 Master Thesis Palaeoclimate and Geo-ecosystems (24 EC)
AM_1150 Master Thesis Earth Sciences and Economics (24 EC)	AM_450407 Master Thesis Earth Sciences and Economics (27 EC)

\* Students who started their specialization programme Applied Environmental Geosciences or Palaeoclimate and Geo-ecosystems can select their master thesis according to these respective programmes..

From 1 September 2014 students complete the new research project or thesis unless they already started the former component.

Students who started their programme before academic year 2014-2015 are, under specific conditions, permitted to replace compulsory courses by a different compulsory course from the former examination programme as detailed below.

a. For students who started Palaeoclimate and Geo-ecosystems (PG) in 2013-2014 or earlier:

Compulsory course	Permitted replacement course
AM_450332 Global Biogeochemical Cycles (6 EC)	AM_450313 Modern Geo-ecosystems (3 EC)

b. For students who started Applied Environmental Geosciences (AEG) in 2013-2014 or earlier:

Compulsory course	Permitted replacement course
AM_450226 Basics in GIS (3 EC)	AM_450313 Modern Geo-ecosystems (3 EC) or AM_450187 Man and Climate: From Hominids to Modern Civilisation (3 EC) or AM_450004 Climate Modelling (3 EC) or AM_450188 Climate and Policy (3 EC)

c. Students who started ES&E in 2013-2014 or earlier fulfill the requirements for Earth Science oriented and Economics oriented courses with the following courses, in addition to the ones mentioned under 4.2.2:

Earth Science oriented:

- AM\_450137 Aquatic Ecology (6EC)
- AM\_468019 Energy Systems Transitions (6EC)
- AM\_450187 Man and Climate: From Hominids to Modern Civilisation (3EC)
- AM\_450313 Modern Geo-ecosystems (3EC)
- AM\_450170 Reflection Seismics (6EC)
- AM\_450330 Sedimentary Environments and Climate Archive (6EC)
- AM\_1030 Soil and Environment (6EC)
- AM\_450294 Capita Selecta Geoarchaeology (3EC)

Economics oriented:

- AM\_450188 Climate and Policy
- AM\_468018 Energy Technology Assessment
- E\_STR\_IEE International Environmental Economics
- AM\_468023 Water and Policy

### 7. Compulsory components that do not apply for students that started before 2014-2015

For students who started their programme before academic year 2014-2015 the courses below are not compulsory:

For students who started ES&E in 2013-2014 or earlier the courses below are not compulsory:

- AM\_468023 Water and Policy (6 EC)
- AM\_450409 Geothermal Energy (6 EC)
- E\_STR\_ECC Economics of Climate Change (6 EC)

Students that have already successfully completed the course(s) before 1 September 2014 can use this as (an) elective (free optional) course(s)

### 3. Electives

The courses below are no longer available in the programme but are still elective components for students who started their programme in or before the academic year in which the course was taught last and have passed the courses' examinations:

*Courses last offered in academic year 2014-2015*

- AM\_450052 Hydrochemistry (6 EC)
- AM\_1012 Hydrological Systems and Water Management (3 EC)
- AM\_450148 Isotope Hydrology (3 EC)
- AM\_450158 Microstructures in Tectonites (6 EC)
- AM\_450131 Transport Processes in Groundwater (6 EC)
- AM\_450227 Applied GIS (3 EC)

*Courses taught offered in academic year 2013-2014*

- AM\_450137 Aquatic Ecology (6 EC)
- AM\_1015 Sustainable Land Management (6 EC)
- AM\_450292 Historical Geography (6EC)
- AM\_1030 Soil and Environment (6EC)
- AM\_450294 Capita Selecta Geoarchaeology (6 EC)

- AM\_450180 Low Temperature Deformations (3 EC)

The specializations below can no longer be started.

- Applied Environmental Geosciences
- Palaeoclimatology and Geo-ecosystems

Students who started the specializations before academic year 2014-2015 and have passed the specialization specific courses' examinations, can still graduate in the above mentioned specializations.

#### **4. Total of at least 120 EC**

The final examination programme should always total at least 120 EC.

#### **Article 5.3 Publication**

1. The faculty board will ensure the appropriate publication of these Regulations and any amendments to them.
2. The Teaching and Examination Regulations will be posted on VUnet.

#### **Article 5.4 Effective date**

These Regulations enter into force with effect from 1 September 2016.

Advice from Board of Studies,

May 29, 2016

Approved by authorized representative advisory body on 30 June 2016

Adopted by the Board of the Faculty of Earth and Life Sciences / of Sciences on 14 July 2016

## Appendix I

List of articles that must be included in the OER pursuant to the WHW (articles in framed boxes):

### Section A

Art. 1.1	7.13, para 1, WHW
Art. 2.1	7.13, para 2 sub w
Art. 3.2	7.13, para 2 sub e
Art. 4.2	7.13, para 2 sub h and l
Art. 4.3	7.13, para 2 sub n
Art. 4.4	7.13, para 2 sub o
Art. 4.5	7.13, para 2 sub j, h
Art. 4.7	7.13, para 2 sub r
Art. 4.8	7.13, para 2 sub k
Art. 4.9	7.13, para 2 sub p
Art. 4.10	7.13, para 2 sub q
Art. 4.11	7.13, para 2 sub a
Art. 5.1	7.13, para 2 sub u
Art. 5.2	7.13, para 2 sub m

### Section B

Art. 1.2	7.13, para 2 sub i
Art. 2.1	7.13, para 1 sub b, c
Art. 2.2	7.13, para 2 sub c
Art. 3.1	7.25, para 4
Art. 4.1	7.13, para 2 sub a
Art. 4.2	7.13, para 2 sub e, h, j, l
Art. 4.3	7.13, para 2 sub t
Art. 4.4	7.13, para 2 sub e, h, j, l
Art. 4.5	7.13, para 2 sub s
Art. 4.6	7.13, para 2 sub d
Art. 4.8	7.13, para 2 sub k