Teaching and Examination Regulations

Master's Degree Programme

B. programme-specific section

M Hydrology

Academic year 2015-2016

Section B: Programme-specific section

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1. General provisions

Article 1.1 Definitions

a. Excursion: an excursion is a visit to a site outside of the VU University. The student population is supervised by one or more supervisors and acts as one group. An excursion has a typical duration of several hours to a week.
b. Field course: a course which contains a component outside the VU University environment in which students actively practice the application of theory and knowledge, critical thinking, judgement and communication in a field setting. The student population is divided in several smaller groups that work with a supervisor or independently. Field courses generally have a duration of one week or more. A field course usually includes an excursion component.

Article 1.2 Degree programme information

a. The programme M Hydrology CROHO number 60807 is offered on a full-time basis and the language of instruction is English.
b. The programme has a workload of 120 EC.
c. A unit of study comprises 6 EC or a multiple thereof.

Article 1.3 Intake dates

The programme is offered starting in the first semester of the academic year only (1 September). The intake date mentioned in this paragraph ensures that a 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 MSc Hydrology Programme aims to achieve that the graduate should:
a. Have an integrated view of the various components of the hydrological system and its relation to and impacts on the functioning of society and its economic activities.
b. Have specific and fundamental theoretical and practical knowledge of the functioning of hydrological systems and hydrological processes over a broad spectrum of spatial and temporal scales, including climate change.
c. Be experienced in carrying out research independently. This experience is gradually developed by confrontation with research in field courses and through interaction with active researchers and subsequently through active participation in a research project, in a manner that enables 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.
d. Function in his/her discipline at an academic level, both mentally and in daily practice; the MSc Hydrology Programme stimulates the social and personal development of the student by motivating consciousness, independence, communicative behaviour and co-operation.

e. Have 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.

f. Be able to start and successfully complete a PhD project or to successfully compete in the international labour market for positions at an academic level with government or government-related institutions, private companies, or elsewhere.

Article 2.2 Exit qualifications

In all events, a graduate of the degree programme will have the following:

Final attainment levels of the Master Hydrology in relation to Dublin descriptors	
Knowledge and insights	
Dublin descriptor	Final attainment levels
A1. The graduate has specialised theoretical and practical knowledge of the science of hydrology	The graduate has profound knowledge of and insight in: • the interaction between water and the socio economic system related to the use of water resources and impacts of natural hazards and global change; • the impact of global change (land use changes, urbanisation, climate change) on the hydrological system and society; • common hydrological and hydro-economic terminology that is required to understand the development of new hydrological theory and research issues that are presently deemed of major importance in hydrological sciences; • all aspects of the global water cycle and the relation with climate change; • theory of groundwater and surface water flow, soil physics, and the surface energy balance (evaporation theory); • how water interacts with soil, rock, vegetation, the atmosphere and pollutants and how this affects water quality and nutrient fluxes; • the role of the hydrological cycle in earth's climate system; • the dynamic response of groundwater and surface water to short and long-term variations in climate (e.g. rainfall and drought events); • modelling techniques for solving water quantity, quality and related economic issues; • mathematics, physics and chemistry that conforms to the standard needed to conduct modern hydrological research; • the most important hydrological and economic methodology and instrumentation techniques; including familiarity with state-of-the-art computer simulation models to solve hydrological problems; • various relevant measurement techniques to solve hydrologic and hydro-economic issues, including field measurements (e.g. runoff, meteo), remote sensing and surveying ; • the links between hydrology and related natural and social sciences.
Application of knowledge and insight	
Dublin descriptor	Final attainment levels
B1. The graduate is experienced in carrying out research.	The graduate is able to: • formulate a problem based on raw data and/or data from a literature study and design a scientific approach for researching and solving the problem; • formulate a research proposal, which includes the problem formulation, the hypotheses, the proposed execution and the finalisation of the project; • set up and execute a hydrological field experiment;

B2. The graduate is able to apply scientific knowledge to problems raised in society.	• select the appropriate and most efficient techniques for field and laboratory data collection; • apply these techniques to independently collect data for the formulation and testing of hypotheses; • write simple computer programs for data processing and analysis; • develop conceptual and physical models suited for the testing of the hypotheses; • validate and calibrate hydrological and risk models • select and order information according to its importance for the study and be able to draw connections between different datasets; • apply hydrological knowledge to solve problems related to the use of water in our society; • use quantitative methods to integrate knowledge on hydrology and society in order to study their relation and be able to evaluate impacts of hydrology on society and vice versa; • start and successfully complete a PhD study; • successfully compete in the international market for positions at an academic level with government or government-related institutions, private companies, or elsewhere.
Critical judgement	
Dublin descriptor	Final attainment levels
C1. The graduate is able to independently and critically judge information. C2. The graduate is able to think within a multidisciplinary framework C3. The graduate has an understanding of his/her personal stronger and weaker points,	The graduate can: • understand professional literature and to judge its quality and usefulness for own research; • analyse existing hydrological research projects with respect to the planning, the execution and the evaluation of the results; • understand the role of hydrological sciences within earth sciences, natural sciences, engineering and economics, and how hydrological knowledge can be used to improve our society; • understand the limitations of data, models, instruments and measurement techniques and how to take these into account for critically evaluating his measurement; • think in a multidisciplinary way and recognise the importance of (sub)disciplines and connect different types of factual information; • understand a subject area's limits, i.e. realise that at a certain stage other expertise should be brought in, or that there is a need for interdisciplinary co-operation; • understand his/her personal stronger and weaker points, affinities, development potential and preferences in relation to the discipline chosen and the related professional potential; • 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; • recognise and judge ethical aspects of science and of the application of science.
Communication	
Dublin descriptor	Final attainment levels
D1. The graduate is able to transfer knowledge and skills related to his/her subject area to other persons and to adequately reply to questions and problems posed within society.	The graduate is able: • to complete a report on trainee work, subject matter studied, or research carried out, • 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 actively and constructively participate in discussions on hydrological issues and meetings; • to work together with one or several colleagues with different scientific backgrounds (e.g. earth, economic and social sciences); • to translate his scientific findings into a language that is understandable for the managers of water resources, as well as for the public in general.
Learning skills	
Dublin descriptor	Final attainment levels
E. The graduate has developed learning skills that enable him/her to educate and develop him/herself further in an specific subject area. E2. The graduate functions in his/her discipline at an academic level, both mentally and in daily practice.	The graduate is able to: • independently collect information on hydrological subjects and analyse, summarise and critically evaluate this information; • use modern techniques to maintain his knowledge up-to-date; • read and understand the hydrological journals, as well as the more general natural sciences journals such as Nature and Science; • recognise 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 realise this); • recognise cultural and gender aspects of water issues; • have an understanding of the existence and significance of related subject areas; • to get acquainted with one of the other specializations within the subject area in the course of a few months; • to get acquainted, within a reasonable time, with a subject area different from the one of the 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 Bachelor's degree level, obtained at an institution of academic higher education:
   a. knowledge of: exact sciences (mathematics, physics and chemistry) and earth sciences (BSc geology, physical geography)
   b. understanding of: common processes in exact, earth or environmental sciences
   c. skills: general academic skills, such as analytical and critical thinking, English language skills, scientific writing skills as demonstrated by a BSc thesis
2. The Admissions Board will investigate whether the interested person meets the admission requirements. If the interested person only partially meets the criteria above the Board may make additional demands of the student before granting admission to the Master.
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 methods and techniques; i.e. field or laboratory experience
   c. willingness to address limited deficiencies through inclusion of self-study courses in the Master's programme
4. Any individual who has obtained a Bachelor's degree in academic higher education on one of the degree programmes meets the requirements referred to in paragraph 1:

a. Earth sciences / physical geography (VU University, University of Amsterdam, Utrecht University)
b. Earth sciences / physical geography of a recognised academic institution with upper second-class honours and above, or GPA higher than 3.07.
c. Earth and Economy (VU University) when including at least two of the following three courses: Wis- en Natuurkunde (AB_450073), Inleiding in de anorganische geochemie (AB_450336), Methoden en technieken voor economisch onderzoek (AB_450346).
d. Future Planet Studies BSc (UvA) with a major in earth sciences / physical geography
e. Civil engineering, Environmental Engineering or Environmental Science (higher vocational education – HBO) with a minor in earth sciences from the VU University, which includes the courses System Earth and Introduction into Inorganic Geochemistry
f. Students who hold an equivalent BSc qualification, with upper second-class honours and above or GPA higher than 3.07, from an institution outside of the Netherlands may be admitted to the Master Hydrology at the *VU University Amsterdam* on the basis of a decision to that effect taken by the Admission Board of the Master. The Board will determine whether the foreign qualification is sufficiently relevant to warrant admission to the Master Hydrology and will specify the programme within the Master Hydrology to which the candidate is admitted. The Admission Board may make additional demands of the student before granting admission to the Master.

5. 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

1. The MSc Hydrology has no pre-master programme.

Article 3.3 Limited programme capacity

1. The VU faculty board will, if necessary, announce the maximum programme capacity by 1 May prior to the start of the academic year.
2. If the programme capacity determined by the VU faculty board is exceeded, the available places will be allocated by means of a non-weighted draw procedure among the candidates who have registered at least two months before the start of the academic year.

Article 3.4 Final deadline for registration

A candidate must submit a request to be admitted to the programme through Studielink before the dates that are determined in the Application and Registration Regulation (at http://www.vu.nl/en/programmes/practical/policies/index.asp). 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:
   a. IELTS: 6.5

b. TOEFL paper based test: 580
c. TOEFL internet based test: 92-93
d. 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:
   a. met the requirements of the VU test in English language proficiency TOEFL ITP, with at least the scores specified in paragraph 1, or
   b. had previous education in secondary or tertiary education in an English-speaking country as listed on the UvA / VU website, or
   c. 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 most appropriate Examinations Board.
3. The free curriculum is put together by the student (in consultation with the MSc coordinator) from the units of study offered by the University of Amsterdam / VU University Amsterdam 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:
   1. at least 60 EC must be obtained from the regular curriculum, including the field courses (450126 and 1013).
   2. 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

Article 4.2 Compulsory units of study

The compulsory units of study are:

Year 1

Name of course component	Course code	Number of credits	Period	Teaching method	Type of test	Level
Catchment Response Analysis	AM_450003	6	1	Lectures / workshops	Written exam / modelling exercise	400
Ecohydrology	AM_450014	6	1	Lectures / workshops	Written exam / presentation	400
Groundwater	AM_1164 *or*	6	2	Lectures /	Written exam /	400

Processes ***or*** Water Economics	AM_1167			workshops	Assignments	
Unsaturated Zone and Near Surface Hydrological Processes	AM_450021	6	2	Lectures / workshops	Written exam/ modelling report	400
Integrated Modeling in Hydrology	AM_1165	6	3	Lectures / practicals	Assignments / Report / Presentation	400
Water Quality	AM_1166	6	4	Lectures / workshops	Written exam/ practicals	400
Water Economics ***or*** Groundwater Processes	AM_1167 *or* AM_1164	6	4	Lectures / workshops	Written exam / Assignments	400
Measuring techniques in Hydrology	AM_1168	6	5	Field course	Assignments	400
Field Course Hydrology	AM_1169	12	5/6	Field course	Field performance / Article	500

Year 2

Name of course component	**Course code**	**Number of credits**	**Period**	**Teaching method**	**Type of test**	**Level**
Advanced Groundwater Processes	AM_1171	6	1	Lectures / practicals	Written exam / Assignments	400
Master Thesis Hydrology	AM_1170	36*	2-6	MSc Project	Performance / Report / Presentation	600

* The examination Board can, given proper motivation, grant the student permission to extend the Master thesis by 12 EC.

Article 4.3 Practical exercise

Except for those practical components incorporated in the compulsory units of study above (e.g. field courses, laboratory practicals, research project) and in relevant electives, the MSc Hydrology has no separate practical exercise.

Article 4.4 Electives

The student can take the following electives:

Name of course component	**Course code**	**Number of credits**	**Period or semester**	**Teaching method**	**Type of test**	**Level**
Climate Modeling	450004	6	3	lectures	Written exam / computer practicals	400
Geomicrobiology	450132	6	1	Self-study	Essay, oral evaluation	
Geothermal	450409	6	5	Lectures/practicals	Practicals /	400

Energy*					case studies evaluations	
Scientific Writing in English	471023	3	Ac. year	Lectures / practicals	Various evaluations	400
Water & Policy	AM_468023	6	1	Lectures	Written exam & essay	400
From Source to Sink; Chemical and Physical Cycles	450146	6	2	Lectures	Written exam, essay, practicals	400
Reflection Seismics for geologists	450170	6	4	Lectures/ practicals	Written exam & practicals	400
Climate and Policy	450188	6	3	Lectures	Written exam / paper	400
Modern Climate and Geo-ecosystems	AM_1124	6	1	Lectures / workshops	Written exam / essay	400
Global Biogeochemical Cycles	AM_450332	6	4	Lectures	Written exam /assignments	400
Ecotoxicology and Water Quality	AM_1054	6	2	Lecture / laboratory practicals	Written exam, practicals, presentations	400

* Course module is offered every other year. Next edition 2016-2017

If the student wishes to include a different elective course than the units of study listed, advance permission must be obtained in writing from the Examinations Board. Following elective courses outside VU University is also possible, particularly with institutes with which the program has a formal agreement.

Article 4.5 Sequence of examinations

Students may participate in examinations [and/or practical exercises] for the units below only if they have passed the examination or examinations for the units mentioned:

- Field Course Hydrology (AM_1169) after passing at least two of the courses Catchment Response Analysis (AM_450003), Groundwater Processes (AM_1164), Water Quality (AM_1166), and Unsaturated Zone and Near Surface Hydrological Processes (AM_450021) before April 1 of the year in which the field course is organized.
- Master Thesis Hydrology after passing registration of at least 36 EC of the master programme concerned.

Article 4.6 Participation in practical training and tutorials

1. In the case of a practical, the student must attend 100 % of the practical sessions. Should the student attend less than 100 %, he/she must repeat the practical, or the examinator of the course may issue one or more supplementary assignments.
2. In the case of a work group with assignments, the student must attend 100 % of the work group sessions. Should the student attend less than 100 %, he/she must repeat the work group, or the examinator of the course may issue one or more supplementary assignments.
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.

- either a maximum 40 EC can be accumulated from a *completed* master programme with a duration of two years (120 EC)
- or a maximum of 20 EC can be accumulated from a *completed* master programme with a duration of one year (60 EC)

Article 4.8 Validity period for results

As laid down in article 4.8 of OER 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, as well as paragraph 4 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. **Compulsory components**

   a. The compulsory components below have been replaced in 2015-2016

New component	Former component
AM_1166 Water Quality (6 EC)	AM_450052 Hydrochemistry (6EC)
AM_1168 Measuring techniques in Hydrology (6 EC)	AM_450126 Field Course Netherlands (3 EC)
AM_1165 Integrated	AM_450145 Environmental Remote Sensing (6 EC)

Modelling in Hydrology (6 EC)	
AM_1169 Field Course Hydrology (12 EC)	AM_1013 Field Course Hydrology Portugal (15 EC)
AM_1171 Advanced Groundwater Processes (6 EC)	AM_450008 Groundwater Flow Modeling (6 EC) and/or AM_450131 Transport Processes in Groundwater
AM_1164 Groundwater Processes (6 EC)	AM_450009 Groundwater Hydraulics (6 EC)
AM_1170 Master Thesis Hydrology (36 EC)	AM_1104 Master Thesis Hydrology (27 EC)

From 1 September 2015, students obtain the new course, unless they passed the former course.

The compulsory components below have been replaced in 2012-2013

New component	**Former component**
AM_1104 Master Thesis Hydrology (27 EC)	AM_450122 Master Thesis Ecohydrology O Variant (27 EC) AM_450123 Master Thesis Ecohydrology Traineeship M Variant (27 EC) AM_450124 Master Thesis Hydrogeology O Variant (27 EC) AM_450125 Master Thesis Hydrogeology Traineeship M Variant (27 EC)

From 1 September 2012 students obtain the new thesis, unless they passed the former.

The compulsory components below have been replaced in 2011-2012

New component	**Former component**
AM_1012 Hydrological Systems and Water Management (3 EC)	AM_450057 Regional Hydrogeology and Groundwater Management (6 EC)
AM_1013 Field Course Hydrology Portugal (15 EC)	AM_450173 Field Course Hydrology Portugal (12 EC)

From 1 September 2011 students obtain the new course, unless they passed the former course.

b. For students who started their programme before academic year 2015-2016, the courses below are not compulsory:

- AM_1167 Water Economics (6 EC)

For students who started their programme before academic year 2012-2013 the courses below are not compulsory:

- AM_450008 Groundwater Flow Modeling (6 EC)
- AM_450145 Environmental Remote Sensing (6 EC)
- AM_450131 Transport Processes in Groundwater (6 EC)

Student that have already successfully completed the course(s) before 1 September 2012 can use this as (an) elective (free optional) course(s)

For students who started their programme before academic year 2011-2012 the courses below are not compulsory:

- AM_450014 Ecohydrology (6 EC)
- XX04 Hydrological Systems and Water Management (6 EC)

Student that have already successfully completed the course(s) before 1 September 2011 can use this as (an) elective (free optional) course(s)

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

2. **Electives**

a. The courses below are no longer available in the programme but are still elective (free optional) components for students who started their programme before academic year 2015-2016 and have passed the courses' examinations:

Courses ended in academic year 2014-2015

- AM_450008 Groundwater Flow Modelling (6 EC)
- AM_450131 Transport Processes in Groundwater (6 EC)
- AM_1012 Hydrological Systems and Water Management (3 EC)
- AM_450148 Isotope Hydrology (3 EC)
- AM_450145 Environmental Remote Sensing (6 EC)AM_450204 Applied Geophysics in Hydrology(3 EC)

Courses ended in academic year 2013-2014

- AM_450137 Aquatic Ecology (6 EC)
- AM_1015 Sustainable Land Management (6 EC)
- AM_450185 Modern Climate Systems (3 EC)
- AM_450313 Modern Geo-ecosystems (3 EC)

Courses ended in academic year 2012-2013

None

Courses ended in academic year 2011-2012

- AM_450135 Thematic Research Project Ecohydrology (12 EC)
- AM_450129 Thematic Research Project Hydrogeology (12 EC)
- AM_450133 Contaminant Hydrogeology (6 EC)

Courses ended in academic year 2010-2011

- AM_450060 Soil Vegetation Atmosphere Exchange (6 EC)

b. The final examination programme should always total 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 the faculty website and deemed to be included in the course catalogue.

Article 5.4 Effective date

These Regulations enter into force with effect from 1 September 2015

Advice from Board of Studies, 14 June 2015

Approved by authorised representative advisory body on 15 July 2015

Adopted by the faculty board on 21 August 2015