Handbook ES 2013 - 2015

While UNESCO-IHE Institute for Water Education, Delft does its utmost to ensure that the programme will run as specified in this handbook, the content is subject to change. Certain modules or parts of modules may be changed, withdrawn and/or replaced by other modules. Due to logistical constraints or otherwise, participation of specified lecturers, whether from UNESCOIHE or from partner organisations cannot be guaranteed. No rights can therefore be derived from the programme as specified in this handbook.

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1 UNESCO-IHE

1.1 Introduction

UNESCO-IHE continues the work that was started in 1957 when IHE first offered a postgraduate diploma course in hydraulic engineering to practicing professionals from developing countries. Over the years, IHE has developed into an international education institute providing a host of postgraduate courses and tailor-made training programmes in the fields of water, environment and infrastructure; conducting applied research, implementing institutional capacity building and human resources development programmes, participating in policy development, and offering advisory services world-wide.

The Institute has gradually expanded its academic base to include disciplines such as sociology, economics, and environmental and management sciences. The range of activities has broadened accordingly, from identifying solutions to engineering problems to designing holistic and integrated approaches in the development and management of water and environmental resources, and urban infrastructure systems. The services of the Institute now also include integrated water resources management, effective service delivery and institutional reform, all of which aim to enhance full stakeholder involvement, equity, accountability and efficiency in water sector development and management.

In November 2001, UNESCO's 31st General Conference decided to make IHE an integral part of the Organisation. By March 2003, the necessary treaties and agreements between the IHE Delft Foundation, UNESCO and the Netherlands Government were signed, allowing for the entry into operation of the new UNESCO-IHE Institute for Water Education. UNESCO-IHE is governed by a thirteen-member Governing Board appointed by the Director General, and is managed by a Director and Deputy Director. The IHE Delft Foundation provides all other staff and facilities to UNESCO-IHE.

The mission of the Institute is to contribute to the education and training of professionals and to build the capacity of sector organisations, knowledge centres and other institutions active in the fields of water, the environment and infrastructure, in developing countries and countries in transition.

UNESCO-IHE is located in Delft, an internationally renowned centre of excellence in civil engineering and in water related sciences. The Delft University of Technology, the laboratories of WL/Delft Hydraulics, GeoDelft, and The Netherlands Organisation for Applied Scientific Research are situated nearby. UNESCO-IHE maintains intensive relations with national and international institutions to ensure a continuous exchange of knowledge and experience.

1.2 MSc Degree Programmes

The backbone of the Institute are the postgraduate programmes in the fields of:

- Environmental Science
- Urban Water and Sanitation
- Water Management
- Water Science and Engineering

Each year, these programmes are attended by hundreds of engineers, chemists, biologists, earth scientists, and other professionals from all over the world. The graduates are awarded a Master of Science degree. The programmes are subject to accreditation under Dutch law.

1.3 Research and PhD Programmes

UNESCO-IHE carries out scientific research, often in co-operation with universities and research institutes in developing countries.
A number of positions are available for PhD research.

The PhD programme has a nominal duration of 4 years and can be carried out either in Delft or in a sandwich construction.

The PhD degrees are awarded by UNESCO-IHE together with a Dutch university. Candidates should preferably hold a UNESCO-IHE MSc degree, but an equivalent degree from another reputed university may also be acceptable.

1.4 Organisation

The Rectorate of the Institute consists of a Rector, a vice rector Academic Affairs and a Business Director. The organisation is structured into departments, which are further subdivided into various sections. Within the organisation structure, three academic departments are distinguished:

- Water Science and Engineering
- Environmental Engineering and Water Technology
- Integrated Water Systems and Governance

These departments have one or more academic cores in the major fields, each with a leading professor, who is assisted by academic staff and research fellows. Process management support units and a education bureau provide administrative support.

Besides the academic staff of UNESCO-IHE, education is provided by selected guest lecturers, who are experts employed by universities, research institutes, government agencies, consulting firms, international organisations, etc. in the Netherlands and abroad.

2 Programme framework

2.1 Introduction

The Master of Science Degree Programmes

The Institute provides the following Master of Science degree programmes:

- the master programme in Environmental Science;
- the master programme in Municipal Water and Infrastructure;
- the master programme in Water Management; and
- the master programme in Water Science and Engineering.

These programmes have a nominal duration of 18 months and are leading towards a Master of Science (MSc) degree in the respective field upon successful completion. Each programme has several distinct specialisations, in which students follow a programme curriculum best suited to their preference.

The minimum study load of the programmes is 106 credit points, expressed in units defined by the European Credit Transfer and Accumulation System (ECTS).

2.2 Academic Regulations

The *Education and Examination Regulations* (separately included in this handbook) provide the basic data of the programme, including the major rules around the examinations and the rights of students to inspect the results of the examination assessment.

The regulations describe the precise details of how examinations are assessed and marked, the procedures and rules for re-examinations, procedures for appeal, and which results are required for awarding the Master of Science degree.

Students are strongly advised to familiarise themselves with these procedures at an early stage during their study.

2.3 Structure of the Programmes

The programmes are conducted over a period of 18 months during two academic years. The general planning structure is shown in the *Academic Calendar*.

In the first year, the calendar is divided into 14 periods of three weeks, in which the components of the curriculum are presented as modules. After each second module, a separate week is reserved during which the examinations for the two modules take place. The first six months of the second year are reserved for completion of the MSc thesis research work.

Within each programme, the following generic components are distinguished:

- ten taught modules of 5 credit points each;
- fieldtrips and groupwork, total 10 credit points;
- a special/research topics module of 3 credit points;
- the thesis proposal preparation of 7 credit points;
- the thesis research and examination, 36 credit points.

2.4 Curriculum Information

All components of the programme curriculum are described by a syllabus (summary) in the programme-specific part of the handbook providing the following information, which is further detailed in the sections below:

- the name and code of the subject;
- the learning objectives;
- the pre-requisite knowledge or skills;
- the study load hours and credit points;
- the lecture, exercise and examination contact hours;
- the nature and weights of the examination parts;
- the responsible lecturers/examiners;
- a concise description of the contents and working methods; and
- the required and recommended literature, and other materials.

2.5 Learning Objectives

Each programme specialisation has a set of learning objectives that state the knowledge, insight and skills achieved by students who successfully complete the programme. A distinction is made between discipline-specific learning objectives, which are required by the field of study, and general academic skills, which are expected from university education graduates. The programme objectives for each specialisation are provided in the programme-specific part of the handbook.

Similarly, each component of the curriculum has a set of learning objectives, which detail the specific outcomes if the student completes that part of the programme. The individual subjects usually aim to achieve a further detailed subset of the overall learning objectives.

2.6 Working Methods

The programmes are conducted using a combination of lectures, exercises, assignments and examinations. The latter are described separately in the next section.

Lectures serve one or more of the following functions:

- to impart information;
- to introduce and explore a topic;
- to build-up complex structures step-by-step;
- to clarify and illustrate concepts and ideas detailed in the literature or lecture notes; and
- to provide a framework for further independent study and reading.

An exercise takes one of the following forms:

- a design or practical exercise;
- a computer or other workshop;
- a laboratory session;
- a fieldwork or fieldtrip; and
- a groupwork discussion.

Assignments are carried out independently by the students and consist of all required activity to:

- study or practice the lecture material;
- prepare a report, thesis or presentation;
- work out the results of an exercise;
- conduct an experiment or test;
- prepare for an examination; and
- conduct a research or other study.

2.7 Examinations

Examinations serve to test if students have achieved the learning objectives for a specific component of the programme, and ultimately those of the programme itself. The examination for a component may be composed of multiple parts. For example, a combination of a written or oral test and one or more assignments to handed in separately.

Examination work can also be produced by (small) groups of students working together on an assignment, e.g. the groupwork report.

Assessment of examination material is carried out by appropriate examiners, which are usually the involved lecturers. Students who successfully complete a component of the programme will be granted the credit points for that component. Fieldtrips may require active participation instead of an examination in order to receive the credit points.

For each examination, students are informed about the assessment results via e-mail. When all examinations have been passed, the student has successfully completed the so-called programme examination and will be awarded the degree.

2.8 Study Load

All scheduled education activity taking place in the presence of a lecturer or an assistant is designated as contact time. All other time spent by students in relation to the study programme is designated as independent study time.

The study load for (a part of) a programme is the cumulative contact time and independent study time that is nominally required to successfully complete that (part of the) programme. Study load is expressed in whole ECTS credit points, where one ECTS credit point is equivalent to 28 working hours.

The study load credits for a curricular activity indicate the notional time spent by an average learner to achieve the required outcomes for that activity, as specified by the learning objectives. The nominal time expenditure for a 5 ECTS credit points module is therefore 140 hours.

Where study load involves scheduled class-based activity, one lecture period is taken equal to two hours of contact time.

2.9 Planning and Scheduling

Lectures and exercises taking place inside the Institute are, in principle, scheduled into 'periods' of two hours each, for which the following times are available:

- Period 1 08:45 – 09:30 and 09:45 – 10:30
- Period 2 10:45 – 11:30 and 11:45 – 12:30
- Period 3 13:45 – 14:30 and 14:45 – 15:30
- Period 4 15:45 – 16:30 and 16:45 – 17:30

Throughout the academic year, the student will receive the following information and materials:

- schedules of the educational activities;
- required lecture notes, textbooks and other course-related material;
- announcements of examination planning details; and
- statements on examination results and study progress.

2.10 Participation in coursework and lunch seminars

Active participation and attendance by students is required for all curricular activities on the schedule.

Special attention is required for lunch seminars. During the academic programme lunch seminars are organised focussing on a specific topic. Participants are required to attend these seminars as well

Students have to inform their programme coordinator as early as possible when they are not able to attend a scheduled programme activity.

2.11 Evaluation of the Programme by Students

As part of the quality assurance procedures of the Institute the programmes are routinely evaluated in order to obtain feedback from the students regarding the quality of the content and the performance of the lecturers. The evaluations are based on a module questionnaire, which the students complete in separate class sessions.

The questionnaire asks the students to provide a rating for achievement of the learning objectives, the study load feasibility, the contents of the subject matter, the balance between the various working and examination methods, the quality of the lecture materials, and the presentation by the lecturers. Furthermore, additional written comments and an overall rating for the module may be provided.

The module evaluations are carried after the examination, but before the results have been announced. Students can also request to address specific programme related issues in a group or individual discussion with the involved coordinator or lecturers.

Feedback on the programmes from the students is much appreciated. The Institute uses the results of the evaluations to improve the academic programmes where necessary, in order to maintain high standards of education.

3 Regulations

3.1 Exam regulations

Click here for the separate document:

See the separate part after the Academic Calendar

3.2 Library regulations

Fair use of on-line information resources at the UNESCO-IHE Library

The UNESCO-IHE Library Services provides access to a large number of on-line information resources and databases. Access to these resources is provided to all computer users within the premises at Westvest and through remote authentication via the UNESCO-IHE portal.

By using these on-line resources you agree with the following conditions:

1) Systematic downloading of electronic journals articles using manual means is permitted only within reasonable amounts; no more than 50 downloads per user within 24 hours.

2) Programmatic downloading / 'web crawling' are not allowed. In addition to systematic downloading of files manually, the use of a spider (web crawler), the intention of which is to programmatically download data within a specific website, is prohibited.

3) Copyright/reproduction. It is prohibited to reproduce entire or parts of publications in your own publication without the consent of the publisher. You are obliged to provide a correct source reference of all of the material at all times.

4) Selling and providing material to third parties is strictly forbidden. The re-sale of material purchased subject to license to third parties is prohibited; this applies both within and outside of the Institute for which the materials have been purchased.

5) Permanent archiving. Large-scale archiving is not permitted on the local servers or your hostel personal computer nor is the continued use of these servers as an archive, in collaboration with third parties or otherwise. The temporary storage of archive material for personal use is permitted for a period not longer than 120 days.

6) Making changes to an original work. Infringing upon an original work by merging various original texts into a document or by amending original texts is prohibited. Processing materials in such a way is an infringement upon the copyright that is held by the publisher or the author him/herself.

Infringement of one or all of the above mentioned stipulations will be considered as academic misconduct and will result in disciplinary measures, which will be proportionate to the seriousness of the infraction. The Rector will decide upon the disciplinary measures which will be taken. These measures may include temporary or permanent suspension from attending class.

3.3 Code of conduct

THE RECTORATE OF UNESCO-IHE

In consideration of the need for rules and regulations concerning the safety and the proper use of the buildings, grounds and facilities of UNESCO-IHE by students and visitors;
In accordance with article 7.57h and article 9.2, first paragraph, of the Higher Education and Scientific Research Act of the Netherlands;
Having heard the Student Association Board;

RESOLVES

To establish the following Regulations:

Article 1 Definitions

1.1 WHW

Higher Education and Scientific Research Act of the Netherlands (Staatsblad Bulletin of Acts and Decrees 1992, 593);

1.2 the Director

The director of UNESCO-IHE

1.3 the Rectorate

The director and the deputy director

1.4 Central services department

The central services department of UNESCO-IHE

1.5 Facilities

The institute buildings, the interior and equipments as well as rented office and accommodation facilities

1.6 Buildings

The buildings of UNESCO-IHE, located at Westvest 7, Delft

1.7 Student

Anyone who is enrolled at UNESCO-IHE for the purpose of education provided by UNESCO-IHE and who uses the educational and examination facilities of UNESCO-IHE for this purpose;

1.8 Visitor

Anyone who is not a student nor is employed by IHE-Delft as referred to in article 1.1 of the Collective Labour Agreement (CAO) for Dutch Universities.

Article 2 Compliance requirement for rules, guidelines and instructions

2.1 Any student or visitor making use of the grounds, buildings or facilities of UNESCO-IHE is required to comply with all rules, instructions and/or directions issued by the Rectorate and delegated staff with regard to maintaining order and proper social conventions of the host country within the buildings and on the grounds. According to the in the institutes code of undesirable behaviour the following is considered to be undesirable behaviour: sexual harassment, aggression, or violence, both verbal and non-verbal towards course participants, staff, visitors or contracted staff. Furthermore all participants, staff, visitors and contracted staff are to observe and comply with the rules and regulations with regard to appropriate and legitimate use of the facilities of UNESCO-IHE scrupulously and without delay, and is required to deport him or herself such that:

a. he or she does not cause direct or indirect damage to UNESCO-IHE or to other persons who are present on the grounds or in the buildings of UNESCO-IHE or who make use of the facilities of UNESCO-IHE, nor that he or she causes nuisance or annoyance;

b. he or she does not infringe on the rights of UNESCO-IHE or of other persons who are present on the grounds or in the buildings of UNESCO-IHE or who make use of the facilities of UNESCO-IHE;

c. h e or she does not act contrary to statutory obligations;

d. he or she does not act contrary to appropriate and proper social conventions with regard to people or property.

2.2 It is prohibited to wear clothing that covers the face or to wear other clothing and/or accessories that severely interfere with communication between teaching staff and students or between students themselves or between members of the teaching staff. When sitting an examination it is prohibited to wear clothing that covers the face or to wear other clothing and/or accessories that severely limit the ability to establish the identity of the person in question.

2.3 The Head of the Central Services department may, on behalf of the Rectorate, issue instructions and directions for the purpose of ensuring the smooth and proper use and functioning of buildings and grounds of UNESCO-IHE entrusted to him/her.

Article 3 Disciplinary Measures

The Rectorate may take the following measures against any student or visitor who fails to comply with the contents of these Regulations, with due observance of the procedure described in these Regulations:

a. excluding the student or visitor from the buildings and grounds of UNESCO-IHE or from one or more parts of UNESCO-IHE, with the provision that a student may only be excluded from buildings or grounds in whole or in part for a period not to exceed one year;

b. excluding the student or visitor from the use of the facilities of UNESCO-IHE;

c. fining the student if such fine has been agreed on or follows from the statute;

d. issuing a written reprimand;

e. retribution for damages to properties and or facilities.

Article 4 Exclusion Order by the Rectorate

4.1 The Rectorate may immediately issue an exclusion order for the buildings or grounds, or for parts of those buildings or grounds, to a student or visitor who commits an infringement on these Regulations or the rules referred to in article 2, or it may issue an exclusion order for the institute facilities.

4.2 Anyone who is subjected to measures as referred to in the first paragraph will be given the opportunity for a subsequent hearing as soon as possible by or on behalf of the Rectorate if this was not previously possible due to the urgent nature of the matter at hand.

4.3 The exclusion order will contain at least the following:

a. an indication of the buildings and/or grounds or the parts of the buildings and/or grounds of UNESCO-IHE and/or the facilities or use of the facilities of UNESCO-IHE to which the exclusion order applies;

b. the duration of the exclusion order;

c. the reasons for the exclusion order;

d. any conditions which will result in the effectuation of the exclusion order in case of non-compliance.

Article 5 Termination of the exclusion order

5.1 T he Rectorate may, of its own accord or in response to a request by a person who is subject to a disciplinary measure in the form of an exclusion order as referred to in these Regulations, choose to terminate the exclusion order or alter its scope before it has elapsed if there is sound reason to do so according to the judgement of the Rectorate.

5.2 The Rectorate may attach special conditions to the termination or alteration of the exclusion order.

5.3 If in the judgment of the Rectorate the person subject to the exclusion order, and on behalf of whom a proposal to terminate said order has been forwarded, has not met the special conditions set by the Rectorate, then the original exclusion order will once again be put into force; the period of time that has passed since the termination or alteration of the exclusion order will not be deducted from the originally specified period in this case.

Article 6 Entry into force

These Regulations enter into force on October 1st 2007

Article 7 Method of Citation

These Regulations may be cited as “Regulations for the use of buildings, grounds and facilities by students and visitors of UNESCO-IHE”.

Approved in the rectorate meeting of September 25th 2007

3.4 Plagiarism

NOTE: FAILURE TO COMPLY WITH THE TERMS OF THIS SECTION COULD JEOPARDISE YOUR DEGREE. PLEASE READ AND DIGEST CAREFULLY.

It is very important that all students understand UNESCO-IHE's rules about plagiarism. Students sometimes break these rules unintentionally because they do not realise that some of the ways in which they have incorporated other people's work into their own, before they came to UNESCO-IHE, may be against the rules here.

At the beginning of the programme, and before submitting any assessments, you will be required to agree to an 'own work declaration' (see annex). You will also be invited to give consent for the scanning of your work by plagiarism detection software. Work cannot be submitted unless these conditions are agreed to.

What is plagiarism?

Plagiarism is the act of copying or including in one's own work, without adequate acknowledgement of, intentionally or unintentionally, the work of another, for one's own benefit. It is academically fraudulent. Plagiarism, at whatever stage of a student's course, whether discovered before or after graduation, will be investigated and dealt with appropriately by UNESCO-IHE.

The guidance given below is intended to clear up any misunderstandings you may have about plagiarism. If you are still unsure about how to avoid plagiarism, having read these guidance notes, then you should approach your Programme Coordinator or the UNESCO-IHE Library reference desk for further advice.

All assessed work is looked at carefully to ascertain whether they it is genuinely your own work. You should be aware that UNESCO-IHE regards plagiarism as a serious disciplinary offence which will be penalised as appropriate.

Each assignment you submit must be an independent piece of work. This means that you should be aware of plagiarism risks and regulations but also that there should be no significant overlap between any of the pieces of work that you submit. You cannot receive credit twice for the same piece of work, and so where a piece of assessed work includes material which has already been submitted for assessment, the examiners will disregard the duplicated material when marking.

Please note the following Assessment Regulations:

1. All work submitted for assessment by students is accepted on the understanding that it is the student's own effort without falsification of any kind.

2. Students are expected to offer their own analysis and presentation of information gleaned from research, even when group exercises are carried out.

3. Where students rely on reference sources, they should indicate what these are according to the appropriate convention in their discipline.

4. In proved cases of substantial and significant copying, plagiarism or other fraud, the Rectorate has the power to reduce the classification of, or to revoke, any degree it has already awarded, and to require the degree, diploma or certificate scroll to be returned.

As incidents of plagiarism tend to be handled by UNESCO-IHE in strict confidence, most students will be unaware of the serious harm which proven plagiarism can do to a student's standing. The action taken will be permanently noted on the student's record.

Plagiarism detection

UNESCO-IHE uses a computer program called Turnitin® to assist with the detection of plagiarism. The plagiarism detection service is an online service that enables UNESCO-IHE and its staff to carry out electronic comparison of students' work against electronic sources including other students' work.

Turnitin ® works by executing searches of the World Wide Web, and extensive databases of reference material, as well as content previously submitted by other UNESCO-IHE students. Each new submission is compared with all the existing information. The software makes no decisions as to whether a student has plagiarised, it simply

highlights sections of text that are duplicated in other sources. All work will continue to be reviewed by the course coordinator. Once work has been submitted to the system it becomes part of the ever growing database of material against which subsequent submissions are checked.

The software is used as a tool to highlight any instance where there is a possible case of plagiarism. Passages copied directly or very closely from existing sources will be identified by the software and both the original and the potential copy will be displayed for the tutor to view. Where any direct quotations are relevant and appropriately referenced, the course tutor will be able to see this and will continue to consider the next highlighted case.

Citing references

The key to avoiding plagiarism is to make sure that you give correct references for anything that you have taken from other sources to include in your academic work. This might include, for example, any ideas, theories, findings, images, diagrams or direct quotations that you have used. At UNESCO-IHE the house style for references is based on the Hydrogeology Journal output. If you take any material word for word from another source, it is essential that you make it clear to your reader that this is what you have done.

If you take material from another source, change a few words and then include the reference you may still have committed a plagiarism offence because you have not made it clear to your reader that you have essentially reproduced part of the original source. You should either express the ideas fully in your own words and give the reference or else use clearly labelled direct quotes. Bear in mind that if you include too many direct quotes in your work this may reduce your grade, as the marker will find it difficult to see evidence of your own understanding of the topic. You must also include a bibliography and references section at the end of your work that provides the full details of all of the sources cited within the text. You should be aware that, for work done in other subject areas, you might be expected to use a different referencing system.

The process of referencing may seem rather complicated and arbitrary, if it is new to you, but it should begin to make more sense as you progress through your studies. In order to assess your work and to give you useful feedback your marker needs to have a clear sense of what ideas you have developed for yourself and what comes from elsewhere. To be fair to all of the students on the course it is important that each student is given grades that accurately reflect their own efforts. As you learn to produce work at a Master standard, you are developing the skills that will allow you to participate within wider communities of scholars. In these communities new knowledge and understanding is often developed by building on the work of others. By properly acknowledging earlier work you give credit where it is due and help to maintain the integrity and credibility of academic research in this area. Clear referencing also allows readers to learn about the wider literature through your work. It is often the case that understanding the ways in which particular scholars have contributed to the development of the literature makes it much easier to make sense of the current state of play.

Team work, accidental and self-plagiarism plagiarism

Students sometimes wonder where to draw the line between discussing their ideas with their peers (which can be an excellent learning experience) and unacceptable collusion. The time to be particularly careful is when you are preparing work for assessment. You need to be certain that the work you submit represents your own process of engagement with the task set. You may get into difficulty if, for example, reading another student’s plan for their work influences you, or if you show them your plan. Assisting another student to plagiarise is a cheating offence.

In addition to giving references for all of the materials that you have actually included within your assignments, it is important to appropriately acknowledge other sources of guidance you have used when preparing your work.

Accidental plagiarism is sometimes a result of a student not yet having fully come to terms with how to study effectively at university. For example, the ways in which students take their notes sometimes makes it difficult for them to later distinguish between verbatim quotes, paraphrased material and their own ideas. A student may also plagiarise unintentionally because they have been feeling daunted by a piece of work and so have put it off for so long that they have had to rush to meet the deadline. If you think these kinds of wider issues may be relevant to you then you should contact your module coordinator.

Plagiarism guide's references

The following sources were used in the development of the plagiarism guide:

Blum, S. D. (2009). My word! : plagiarism and college culture. Ithaca: Cornell University Press.

Carroll, J. and Appleton, J. (2001). Plagiarism: A Good Practice Guide. Oxford: Oxford Brookes University and Joint Information Systems Committee

Eisner, C., & Vicinus, M. (2008). Originality, imitation, and plagiarism : teaching writing in the digital age. Ann Arbor: University of Michigan Press.

Sutherland-Smith, W. (2008). Plagiarism, the Internet and student learning : improving academic integrity. New York: Routledge.

Harvard University Guide to Plagiarism

http://isites.harvard.edu/icb/icb.do?keyword=k70847&pageid=icb.page355322

Purdue University Writing Lab

http://owl.english.purdue.edu/

University of Princeton Academic Integrity Site http://www.princeton.edu/pr/pub/integrity/pages/plagiarism/

University of Teesside Plagiarism Guidance

http://dissc.tees.ac.uk/Plagiarism/Plag-4.htm

ANNEX 1

TO WHOM IT MAY CONCERN

NAME STUDENT:
……...
STUDENT NUMBER **:**
……...

Own work declaration

I confirm that all the work I shall submit during my study for assignments, reports and my master thesis shall be my own except where indicated, and that:

1. I have clearly referenced all sources;

2. I have referenced and put in inverted commas all quoted text (from books, web, etc);

3. I have given the sources of all pictures, data etc that are not my own;

4. I did not make any use of the essay(s) of any other student(s) either past or present;

5. I did not seek or use the help of any external professional agencies for the work;

6. I acknowledged in appropriate places any help that I have received from others (e.g.fellow students, technicians, statisticians, external sources);

7. I understand that any false claim for any of the above will mean that the work in question will be penalised in accordance with the UNESCO-IHE regulations;

8. I hereby grant UNESCO-IHE, and Turnitin a non-exclusive licence to make an electronic copy of the work and make it available for assessment and archiving purposes.

9. I grant in perpetuity, without restriction, royalty free to UNESCO-IHE Institute for Water Education and partner Institutes the non-exclusive right and license to reproduce, distribute, and display, in whole or in part, my master thesis in any format now known or later developed.

Copyright ownership for all documents remains with the author in accordance with Dutch and international intellectual property law. This agreement does not prohibit the author in any way from entering into a publishing contract.

Signature student:

Date:

4 ES Programme

4.1 Introduction ES Programme

Problems and challenges
Unsustainable management of natural resources hampers the development of mankind and contributes to the unequal distribution of economic welfare. Pollution, depletion of resources and disintegration of ecological functions are of global, regional and local concern. Considering the anticipated economic development and increase in standards of living in developing regions, these issues will become even more urgent in the future. Thus it is not surprising that wise management of our precious (water) resources, environmental conservation, alleviation of poverty and sustainable development are high on the agenda of global concerns [1] .

It is now widely acknowledged that, to prevent continued environmental degradation and the decline of human society, interactions between man and the environment have to be sustainable. Sustainability depends on the delicate balance between the use and the conservation of our environmental resources. The challenge to sustainable development, then, is to stimulate further expansion of living standards worldwide while minimising and counteracting the negative impacts on the environment.

Aim of the programme
The aim of the Environmental Science programme is to provide professionals with the knowledge and skills necessary to contribute, directly or indirectly, to the conservation and wise-use of natural resources for the benefit of society. Successful participants will (i) develop the capacity to carry out independent scientific and technical research and assessments on environmental issues, (ii) learn to analyse and assess environmental systems and problems, (iii) be able to propose sustainable solutions to environmental problems and (iv) contribute to the development of policies and strategies for environmental planning.

Our Approach
To address environmental problems and find sustainable solutions, we must understand the processes that sustain the natural systems, how the systems function and how they interact with each other and with human society. A thorough understanding of how natural systems respond to human actions and interventions is crucial. Through knowledge of the dynamics, functioning and processes of natural systems and an appreciation of the delicate balance between the use and the conservation of our natural resources, improvement of quality of life for human society and sustainable development can be achieved. To equip professionals with the required capacities, the Environmental Science programme offers a systems approach that investigates different subsystems and the interactions between them at the global, regional and local scale, but without losing sight of the overall picture. In exploring the complexities of the human-environmental system the programme seeks a balance between the disciplines taught and the added value of bringing these disciplines together in one coherent programme. Furthermore, the approach of UNESCO-IHE is problem-oriented with a primary focus towards developing countries. This means that the value of the achieved knowledge and skills is measured in terms of applicability of the science, technology, engineering, planning and policies to environmental management. Planning and good policy-making in Environmental Science is based on an understanding of how ecosystems work, how they respond to defined human actions and what remediation actions may be taken to reinvigorate the dynamism of sustainability and biodiversity conservation. As the concept of sustainable development needs its own unique elaboration in contexts where living conditions of large populations are in a critical stage and environmental protection is seen as a luxury, the programme provides tailored approaches and specific knowledge to serve these conditions.
In environmental science education, the development of knowledge together with skills is essential. In the UNESCO-IHE approach, lectures by experts in the field are complemented by assignments, exercises, laboratory and fieldwork and group-work. Innovative distance learning and electronic interactive educational tools support the programme, while further innovations and developments to link up with UNESCO-IHE's global network of partner institutions are ongoing.

Scope of the programme and specialisations
Environmental Science is a broad field; any Master Programme in this field is necessarily limited. The UNESCO-IHE Master Programme in Environmental Science provides an overview of the field with emphasis on aquatic and wetland ecosystems and water related issues such as water quality management, nutrient cycles, water pollution control, natural systems for wastewater treatment, and the functioning and use of wetlands. Within this scope the programme offers six specialisations that lead to a Master of Science (MSc) Degree.

[1] World Summit, Johannesburg 2002; World Water Vision, The Hague 2000; UNCED Conference, Rio de Janeiro 1992; UN Conference on the Human Environment, Stockholm 1972.

4.2 Learning objectives for the programme

After successful completion of the ES programme, graduates will be able:

Knowledge & theory

- to demonstrate knowledge and understanding of the physical, chemical and biological processes of the environment, of the socio-economic concepts underlying the functioning and exploitation of environmental systems, and of the complex inter-relationship between the protection and wise use of environmental resources;
- to describe the rationale for an integrated and interdisciplinary approach for the sustainable management of water and environmental resources;

Methods, techniques & tools

- to design, optimise and interpret environmental monitoring and assessment schemes (including statistics and modelling) in order to gain an understanding of problems, trends, causes and effects;

Analysis, synthesis & integration

- to critically analyse and evaluate a range of options and alternatives for the prevention or remediation of environmental problems, under different socio-economic, cultural and legal contexts, and under often data-poor conditions;

Research/General academic skills

- to conduct research, independently or in a multidisciplinary team, including the formulation of research questions and hypotheses, the selection and application of research methodologies and techniques and the formulation of well-founded conclusions and recommendations;
- to communicate, debate and defend, clearly and systematically, findings and generated insights, and provide rational underpinning of these in oral and written presentations to a variety of audiences;
- to demonstrate academic attitude and learning skills (including thinking in multidisciplinary dimensions and distinguishing main issues from minor ones), to enhance and keep up-to-date the acquired knowledge and application skills in a largely independent manner.

4.3 Specializations

The Environmental Science programme has the following specialisations:

- Environmental Science & Technology (EST)
- Environmental Planning & Management (EPM)
- Water Quality Management (WQM)
- Limnology & Wetland Management (LWM)
- International Master of Science in Environmental Technology and Engineering (IMETE)
- International Master in Environmental Technology for Sustainable Development (ETSuD)

Objectives

- To provide an integrated course for scientists, technologists and engineers who have an interest in research and development, with the knowledge and skills to address environmental problems and interact with stakeholders, managers and policy makers for appropriate remedial actions.

Subjects

- Introduction Environmental science (natural processes, human dimensions, analytical tools), Environmental Systems Analysis, Environmental Engineering, Environmental Monitoring & Modelling, Cleaner Production & the Water Cycle, International Fieldtrip, Aquatic Ecosystems, Solid Waste Management, Group work, MSc Preparatory course, MSc Proposal Writing, MSc Thesis.

Additional learning objectives for Environmental Science & Technology

After successful completion of the specialisation graduates will be able:

Knowledge & theory

- to identify the impacts of human activities on the environment, under different levels of environmental stress and in different socio-economic contexts;
- to name and explain concepts, instruments and technologies for pollution prevention and remedial actions in a national and international context;

Methods, techniques & tools

- to apply general methods (including statistics and modelling) in scientific and technological approaches, concepts and interventions;
- to contribute as a flexible and creative member in interdisciplinary teams in developing solutions for prevention or remediation of environmental problems, by linking scientific knowledge to engineering interventions and to management decisions in different cultural and socio-economic contexts, and using different levels of available knowledge and information.

Objectives

- To provide scientists and engineers who wish to specialise in environmental planning and management with the know-how and skills for strategic development, policy-making and decision-making in the environmental arena.

Subjects

- Introduction Environmental science (natural processes, human dimensions, analytical tools), Environmental Systems Analysis, Environmental Policy Making, Environmental Planning, Water and Environmental Law & Institutions, International Fieldtrip, Aquatic Ecosystems, Watershed & River Basin Management, Group work, MSc Preparatory course, MSc Proposal Writing, MSc Thesis.

Additional learning objectives for Environmental Planning & Management

After successful completion of the specialisation graduates will be able:

Knowledge & theory

- to understand the environmental policy cycle and planning process and to analyse and prepare environmental policy strategies, taking into account the impact that society has on water and environmental resources;
- to name and explain principles, concepts and instruments of major national and international water and environmental legislation and common and desired institutional and management arrangements;

Methods, techniques & tools

- to apply general scientific methods (including statistics and environmental modelling) to processes of water and environmental resources allocation and use at different scales in order to gain an understanding of problems, trends, causes and effects;
- to apply environmental scientific methods (including environmental impact assessment, policy analysis, resource valuation, environmental economics) and models for institutional development with emphasis on policy development, functional decentralisation and good governance;
- to design and facilitate consultation- and decision-making processes between stakeholders, users and their representatives, water managers, politicians and other decision-makers..

Analysis, synthesis & integration

- to identify and critically assess the different ecological and socio-economic functions and values of the environmental system and the, often competing, interests of the various stakeholders;
- to design comprehensive environmental resources policies and strategies that aim to enhance the sustainable use of the environment especially focusing on water, and that include a suitable combination of technical, legal, administrative and financial measures.

Objectives

- To provide an integrated course for scientists and engineers responsible for water quality maintenance/improvement in the catchment, urban and rural environments, with the technical knowledge and management skills for decision-making and environmental planning.

Subjects

- Introduction Environmental science (natural processes, human dimensions, analytical tools), Water Quality Assessment, Wetlands for Water Quality, Environmental Planning, Water and Environmental Law & Institutions, International Fieldtrip, Aquatic Ecosystems, Watershed & River Basin Management, Group work, MSc Preparatory course, MSc Proposal Writing, MSc Thesis.

Additional learning objectives for Water Quality Management

After successful completion of the specialisation graduates will be able:

Knowledge & theory

- to identify the impacts of human activities on aquatic ecosystems;
- to name and explain principles, concepts and instruments of main national and international water and environmental legislation and common and desired institutional and management arrangements;

Methods, techniques & tools

- to interpret, design and optimise water quality monitoring and assessment schemes in the watershed;
- to apply experimental, statistical and modelling tools for interpreting and designing water quality management programmes;

Analysis, synthesis & integration

- to contribute as a flexible and creative member in interdisciplinary teams in developing solutions for water quality management problems in different cultural and socio-economic contexts, and using different levels of available knowledge and information;
- to critically analyse and evaluate alternative water quality management programmes in the watershed under different socio-economic and legal contexts, often in data-poor conditions.

Objectives

- To provide scientists and engineers, interested in aquatic research and development, with a knowledge and understanding of the structure and functioning of aquatic and wetland ecosystems for their management and wise use, and interact with stakeholders, managers and policy makers for the development of best practices.

Subjects

- Introduction Environmental science (natural processes, human dimensions, analytical tools), Environmental Systems Analysis, Wetlands for Water Quality, Lake Ecology, Stream and River Ecology, East-African Wetlands for Water Quality, Fisheries and Aquaculture, Microbial Communities & Ecosystem Functioning, Conservation and Restoration Ecology, Group-work: IWRM & Management of Aquatic Ecosystems, Water Quality Monitoring & Bio-indicators, MSc Preparatory course, MSc Proposal Writing, MSc Thesis.

Additional learning objectives for Limnology & Wetland Management

After successful completion of the specialisation graduates will be able:

Knowledge & theory

- to identify the impacts of human activities on freshwater ecosystems in different socio-economic contexts;
- to demonstrate knowledge and understanding of the international water quality guidelines;
- to name and explain concepts, instruments and technologies for protection and remedial actions of freshwater ecosystems;

Methods, techniques & tools

- to design, optimise and interpret environmental monitoring and assessment schemes for freshwater ecosystems;
- to apply general scientific methods (including statistics and environmental modelling) for the development and application of scientific and technological approaches, concepts and interventions to address problems of freshwater ecosystems;

Analysis, synthesis & integration

- to critically analyse and evaluate a range of options and alternatives for the prevention or remediation of problems related with freshwater ecosystems, under different socio-economic and legal contexts, and under often data-poor conditions;
- to contribute as a flexible and creative member in interdisciplinary teams in developing solutions for prevention or remediation of freshwater ecosystems problems, by linking scientific knowledge to engineering interventions and to management decisions in different cultural and socio-economic contexts, and using different levels of available knowledge and information.

4.8 IMETE

Objectives

- The IMETE programme will educate a new generation of environmental scientist and engineers that can provide adequate and state-of-the art environmental technology and engineering solutions to tackle complex, multidisciplinary environmental issues, such as today's global environmental pollution problems.

Subjects

- Introduction Environmental science (natural processes, human dimensions, analytical tools), Environmental Microbiology, Environmental Engineering, Wastewater Treatment, Sludge Management, Atmosphere Protection Technology, Waste Management and Treatment, Clean Technology, Environmental Fate and Management of Heavy Metals and Metalloids, Microbial Re-use Technology, Research Methodology, Elective Project, MSc Proposal Writing, MSc Thesis.

Additional learning objectives for International Master of Science in Environmental Technology and Engineering (IMETE)

After successful completion of the specialisation graduates will be able:

Knowledge & theory

- to identify the way polluted water, waste, gas, soils and sediments can be treated;
- to identify the way ecosystems and the atmosphere can be protected from pollution.
- to identify the way to prevent environmental pollution through resource management and application of re-use technologies.

Methods, techniques & tools

- to be able to develop, design and apply technologies for the prevention and remediation of environmental pollution by searching scientific information, by conducting scientific research in the field of environmental technology and engineering and by reporting their findings by means of scientific reports and papers;
- to communicate effectively in English and transferring knowledge to both the scientific and non-scientific world through oral presentations and media communications.

Analysis, synthesis & integration

- to demonstrate creativity and critical, multidisciplinary thinking for problem-solving and decision-making;
- to demonstrate responsibility and own initiative;
- to demonstrate capacity to work in an international, multi-cultural team.

Objectives

- The ETSuD programme offers students the possibility to study at two renowned institutes for international postgraduate education: AIT and UNESCO-IHE. The coursework part of the programme starts at AIT in Bangkok in August, where students follow a number of courses until the second half of December. In early January, they move to Delft where they join students in UNESCO-IHE's Environmental Science programme for six modules and group work. Students then move back to Bangkok for their individual thesis research work with involvement of UNESCO-IHE counterparts.

Subjects

- Environmental Chemistry and Laboratory, Air Pollution Engineering and Management, Solid Waste Management, Environmental Impact Assessment, Wastewater treatment, Drinking Water Treatment, Environmental Health and Sanitation, Design of Water Supply and Wastewater Systems, Air Pollution Modelling and Applications, Hazardous Waste Technology and Management, Design of Air Pollution Control Systems, Membrane Technology in Water and Wastewater Treatment, Waste Reduction and Recycling, Applied Microbiology and Laboratory, Advanced Processes for Wastewater Treatment, Reuse and Recycle, Analytical tools in Environmental Science, Environmental Systems Analysis, Wetlands for wastewater treatment, Cleaner Production, Foreign Fieldtrip + Fieldwork, Aquatic Ecosystems, Group Work, Research Methodology, Elective Project, MSc Proposal Writing, MSc Thesis.

Additional learning objectives for International Master in Environmental Technology for Sustainable Development (ETSuD)

After successful completion of the specialisation graduates will be able:

Knowledge & theory

- to identify the impacts of human activities on the environment, under different levels of environmental stress and in different socio-economic contexts;
- to name and explain concepts, instruments and technologies for pollution prevention and remedial actions in a national and international context.

Methods, techniques & tools

- to apply general methods (including statistics and modelling) in scientific and technological approaches, concepts and interventions;
- to contribute as a flexible and creative member in interdisciplinary teams in developing solutions for prevention or remediation of environmental problems, by linking scientific knowledge to engineering interventions and to management decisions in different cultural and socio-economic contexts, and using different levels of available knowledge and information.

Analysis, synthesis & integration

- to demonstrate creativity and critical, multidisciplinary thinking for problem-solving and decision-making;
- to demonstrate responsibility and own initiative;
- to demonstrate capacity to work in an international, multi-cultural team.

Objectives

- The EST-UNIVALLE programme offers students the possibility to study at two renowned institutes for international postgraduate education: Universidad del Valle and UNESCO-IHE. The coursework part of the programme starts at Univalle in Cali in August, where students follow a number of courses until the second half of December. In early January, they move to Delft where they join students in UNESCO-IHE's Environmental Science programme for eight modules and group work. Students then move back to Cali for their individual thesis research work with involvement of UNESCO-IHE counterparts.

Subjects

- Chemistry of Environmental Pollution, Environmental Pollution Microbiology, Fundamentals of Environmental Processes, Environment and Devlopment, Engineering Research Introduction, Integrated project Environmental Science, Environmental Systems Analysis, Environmental Engineering, Environmental Monitoring & Modelling, Cleaner Production & the Water Cycle, International Fieldtrip, Aquatic Ecosystems, Solid Waste Management, Group work, MSc Preparatory course, MSc Proposal Writing, MSc Thesis.

Additional learning objectives for Environmental Science & Technology

After successful completion of the specialisation graduates will be able:

Knowledge & theory

- to identify the impacts of human activities on the environment, under different levels of environmental stress and in different socio-economic contexts;
- to name and explain concepts, instruments and technologies for pollution prevention and remedial actions in a national and international context;

Methods, techniques & tools

- to apply general methods (including statistics and modelling) in scientific and technological approaches, concepts and interventions;
- to contribute as a flexible and creative member in interdisciplinary teams in developing solutions for prevention or remediation of environmental problems, by linking scientific knowledge to engineering interventions and to management decisions in different cultural and socio-economic contexts, and using different levels of available knowledge and information.

5 Facilities

5.1 Location

The UNESCO-IHE buildings and facilities are located on a single compound at the Westvest 7 in the centre of Delft. The buildings provide a pleasant and efficient atmosphere for optimal learning and creativity, direct communication with lecturers and other staff, as well as meeting with fellow students. The building is open during the following times:

Monday to Friday 07:30 – 20:00

Saturday 08:00 – 12:30

5.2 Student Affairs (office)

The Student Affairs office provides non-academic support to students. The SA office takes care of student applications and student registration. The new students are also assisted with formalities such as applications for residence permits, insurance, bank accounts, and fellowship issues. Housing arrangements in one of the hostels are being made immediately upon arrival.

Throughout their study period, students can contact the staff during office hours for information or questions related to health, religion or other issues related to the student's well being. Personal matters can be discussed with the student counsellor and will be dealt with strictly confidential.

During the entire academic year, SA organizes a number of social and cultural activities including the weekly movie night, social evenings and the annual Christmas dinner. Other activities include cultural excursions to interesting cities and places in the Netherlands and other countries in Europe.

Furthermore, the students are given opportunity to actively practice sports on a regular basis. From October to May, the Institute arranges accommodation in Delft for such sports as soccer, volleyball, basketball and badminton. The SA office organizes sports events and tournaments, in which the teams can compete internally, but also against players from other international institutes.

5.3 Student Association Board

The Student Association Board (SAB) is composed of representatives who are elected by the students in annual elections that take place some four weeks after the opening of the academic year.

The SAB provides a forum through which students can share their experiences, problems and general issues on study-related matters. If necessary, the SAB will bring these matters forward in discussions with the executive levels of the Institute. The board can be contacted directly via its members or the general e-mail address sab@unesco-ihe.org.

The SAB closely co-operates with the Student Affairs office in organizing social and sporting events. The board also publishes its own magazine *The Informer*, in which the rich variety of contributions are entirely derived from, and produced by, the student community.

5.4 ICT services

UNESCO-IHE provides modern computing (IT) facilities for education and research. A local wired- and wireless network is available in UNESCO-IHE's building. Through UNESCO-IHE's networks all computers have access to a fast Internet connection. Besides that, participants have unlimited access to Internet in all hostels provided by UNESCO-IHE.

All UNESCO-IHE desktop and laptop PCs are Intel based with Microsoft Windows operating system. The UNESCO-IHE laptop PC will be provided in order to get access to the IT-facilities. The laptop is on loan for use during studying at UNESCO-IHE. At the end of the study, UNESCO-IHE offers the possibility to buy the laptop. The contract given clearly states the terms and conditions for borrowing the laptop. Bringing one's own laptop is allowed; however, laptops other than the UNESCO-IHE laptop might not give access to all the required IT-facilities and might not be supported by IT-service desk.

A wide range of software packages is available, ranging from standard PC-software, like Microsoft Office (Word, Excel, etc.) to special modelling software used for the educational programmes. All participants will get a free UNESCO-IHE web-based e-mail box. A web-based E-learning and collaborative system is accessible for all participants to exchange learning information and documents.

For specific applications during the thesis study, it may be possible to use specialist software packages on the laptop PCs. This is, however, dependent on the particular type of licence agreement that the Institute has with the supplier. Enquiries for specific software should be made at the computer helpdesk.

5.5 General Facilities in the Building

In the reception area of the building, students have their own locker for the distribution of schedules, lecture notes and other study-related papers, and private mail. Last-minute changes in schedules are indicated on the announcement board near the entrance. Two monitor screens opposite the reception desk are regularly updated with news or information on events taking place at UNESCO-IHE.

Private telephone calls can be made from card-operated phone booths located next to the reception desk. Photocopy services are available to students. There is also a facility to recharge chip-cards, which students receive from the bank to pay for small purchases without using cash. Furthermore, the building contains a meditation room, which is located on the third floor.

The restaurant provides a wide variety of reasonable-priced multicultural meals and beverages during lunchtime. The meals can be paid using the chip-card or cash. Coffee, tea and soft drinks can be obtained from machines throughout the day.

The building houses a number of fully-equipped lecture rooms and theatres, which can accommodate groups of all sizes from 15 to 300 persons. Rooms for facilitating computer classes and workshops are present and can be used freely by students outside class hours. Furthermore, the Institute has its own printing and reproduction facilities and also contains an in-house distance learning and video conferencing centre. The library, computer facilities and laboratory are described in detail below.

5.6 UNESCO-IHE Library and Information Services

UNESCO-IHE's Library provides access to over 35,000 printed titles, among which the complete collection of UNESCO-IHE Master thesis and PHD dissertations. Furthermore the collection contains over 8.000 online journals. The online journals collection is accessible on the network at the Westvest premises or through remote authentication through the UNESCO-IHE portal. For more information please visit the Library's Internet page http://www.unesco-ihe.org/library

The library is open to all UNESCO-IHE participants and staff, and to visitors by appointment. The services provided by the library include lending out books, requesting articles and other materials through the inter-library loan system and providing assistance in searching the electronic catalogue.

Membership

Upon registration UNESCO-IHE participants receive a registration card which can also be used to borrow items from the library collection.

The catalogue

The library collection is accessible through an electronic catalogue, which is searchable by author, title (word) and subject, as well as by Boolean operators. Please visit http://www.unesco-ihe.org/library for more information.

Borrowing library items

A maximum of ten items may be borrowed from the library at any one time. The maximum loan period is 21 days, renewable up to a maximum of 42 days. Renewals can be made online, http://www.unesco-ihe.org/library by using the borrower information function within the catalogue or by email (library@unesco-ihe.org). Please note that the loan period can be extended only if the items have not already been reserved by another person.

Reference works, M.Sc theses, bound and non-bound periodicals and materials bearing a green sticker may not be borrowed. By using their library card to borrow items from the library, borrowers agree to be responsible for those

items, including the cost of replacing lost or damaged items.

Opening Hours

Monday 09:00–18.30

Tuesday-Friday 09:00–19.00

Saturday 09:30–12:30

Please note that the Library opening hours are subject to change. Visit the Library webpage for regular updates.

From July 2011 until December 2011, the Library spaces are being renovated. Most of the printed collections and the reference desk have been relocated to A2 a/b on the first floor and on account of missing the reading room, the opening hours have been changed to Monday-Friday 09-15-17.30

For further information please contact the library reference desk.

Email: library@unesco-ihe.org

Tel: +31 (0)15 215 1714

Fax: +31 (0)15 212 2921

5.7 Laboratories

Modern educational and research laboratories are available in the fields of chemistry, process technology, microbiology, aquatic ecology and soil science. A wide range of standard analytical tests can be performed for chemical, physical and microbiological water, air and soil quality analyses.

Elemental analyses, various kinds of microscopy and analytical techniques such as spectrophotometry, gas- and ion chromatography, and atomic absorption can be carried out. A wide range of laboratory and bench-scale reactors, temperature and light controlled growth chambers, and various constant temperature rooms are available for research in one of the departmental research programs, including waste water management using aquatic macrophytes and wetlands, the adsorption and/or (an-)aerobic degradation of micropollutants, self-purification in drains and filtration. Through close co-operation with the Delft University of Technology and other educational and research institutions, research possibilities are quite extensive.

In addition to the in-house facilities, the laboratory has a range of instrumentation and equipment available for field instruction and for conducting hydrological or environmental field experiments and measurements.

5.8 Study Materials

Study materials such as textbooks, lecture notes and hand-outs are provided by the Institute. Students receive the lecture notes in their personal locker before the start of the involved lecture series. Additional material can be provided by the lecturers in the form of hand-outs. Reference works are available from the Institute library or the library of the Delft University of Technology (see above).

A number of supporting materials, such as for example PowerPoint presentations or exercise materials used by the lecturers, can be accessed or downloaded from the electronic repository. Students can login to the electronic repository from any location via the Internet web page located at http://km.ihe.nl.

Students are expected to provide other materials, such as stationary, electronic calculators and language dictionaries on their own account.

5.9 English support courses

Introduction

A variety of academic writing courses are offered to students during the first 12 months of study. Students are allocated a place on these courses according to their language level, not their specialization. Writing courses are

available from 'lower-intermediate' to 'advanced' level, consisting of about 20 hours contact time. These courses run parallel to scheduled lectures, and are not limited to one programme specialization or module.

Placement Test for everyone

Every student must take the English Placement Test. Based on the result, the student may be required to follow an academic writing course.

Placement tests are held in October and January. Participants with weakest English skills are strongly advised to take the test in October, as they will receive support courses first. All remaining participants will be tested in January. Places on writing courses are allocated according to the student's placement test score. A student cannot join a writing course unless s/he has taken the placement test.

Students whose test score is at A1, A2 or B1 level CEFR (The Council of Europe's *Common European Framework* of Reference (CEFR) for Languages is a basis for recognising language qualifications. A1-A2 = Basic; B1-B2 = Intermediate; C1-C2 = Advanced) , are obliged to attend a support course: attendance is required. Students whose test score is B2 are strongly recommended to attend a course. If students who score B2 choose to take a support course, regular attendance is required. Those with score levels C1 and C2 are exempt from academic writing courses.

Scheduling and attendance

Academic Writing courses are given throughout the year, with the first courses starting in October and the last courses ending in August/September. Students are assigned a course based on their Placement Test performance.

English support courses usually consist of about 20 hours contact time, approximately 13 or 14 lectures. English support courses are always scheduled at the following times:

- Tuesdays 3.45pm-5.30pm
- Thursdays 8.45am-10.30am

Occasionally classes are given on Saturday mornings. In special cases, evening classes may be necessary.

A Certificate of Attendance will be provided on completion of an academic writing course, provided attendance requirements have been met.

If a student does not turn up for the allocated course without giving notification of absence, s/he forfeits their place on the course. An alternative course is not provided.

Summary descriptions of writing courses

First Steps in Academic Writing: *lower intermediate*

based on textbook '*First Steps in Academic Writing*', Longman

This course provides low-intermediate students with essential tools to master basic academic writing. It focuses on paragraph organization, sentence structure, and grammar. Students are guided through the writing process to produce well-organized, clearly developed paragraphs. Simple explanations are supported by clear examples to help students through typical rough spots, and numerous practices help students assimilate each skill.

New Headway Academic Skills: *intermediate*

Based on textbook *'New Headway Academic Skills',* Oxford University Press

This course combines reading, writing, and study skills, and is suited to those who have reasonable English but have not studied for a while. It aims to refresh and consolidate existing language through practice, as well as to learn new language. There is guided writing practice and relevant grammatical structures are explained. In addition, skills and strategies which develop good vocabulary learning and recording are included.

Academic Writing: *upper intermediate*

based on textbook '*Focus on Academic Skills for IELTS'*, Pearson-Longman

· Focuses on academic writing skills

· Includes vocabulary building and reading techniques relevant to research.

· Specific writing skills include: collocations; useful phrases and language of research; the language of change (increase, decrease, etc); interpreting and comparing information from diagrams; presenting arguments and opinions; justifying solutions (modal verbs, conditionals) and much more to improve academic writing.

· Life-long learning. This textbook offers systematic preparation for the IELTS exam, hence it can help any student who wishes to gain this internationally-recognised certificate, or improve their existing score.

Advanced Academic Writing: *advanced*

based on textbook '*Academic Writing, A Handbook for International Students*' Routledge

- Specifically aimed at improving key academic writing skills, this is a very practical and thorough course.
- Three main areas are covered: The Writing Process – from making an outline to proof-reading; Elements of Writing – writing skills such as making comparisons, describing results and paraphrasing; Accuracy in Writing – to improve common problems, eg articles, passives, prepositions.

The above courses follow a workshop approach and are designed to provide maximum hands-on practice. There is a strong emphasis on collaborative writing activities for students, with the lecturer adopting the role of facilitator.

MSc Thesis Writing: *for all participants*. A reader is provided.

In August/September a series of lectures is given, open to all MSc participants, on thesis writing. The lectures aim to make participants aware of the conventions and structures used to write a proposal, literature review and thesis, and how to present their judgements in a persuasive and reasoned argument. Topics will include proposal writing, literature review, thesis chapters, argument structure, paragraph writing, editing skills, etc.

UNESCO-IHE - Academic Calendar 2013/2015

YEAR 1																																																					
	2013											2014																		fieldtrip			..											Groupwork			..						
	October		November				December					January				February				March					April				May				June					July				August				September					October		
Week	42	43	44	45	46	47	48	49	50	51	52	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
Mon	14	21	28	04	11	18	25	02	09	16	23	30	06	13	20	27	03	10	17	24	03	10	17	24	31	07	14	21	28	05	12	19	26	02	09	16	23	30	07	14	21	28	04	11	18	25	01	08	15	22	29	06	13
Tue	15	22	29	05	12	19	26	03	10	17	24	31	07	14	21	28	04	11	18	25	04	11	18	25	01	08	15	22	29	06	13	20	27	03	10	17	24	01	08	15	22	29	05	12	19	26	02	09	16	23	30	07	14
Wed	16	23	30	06	13	20	27	04	11	18	25	01	08	15	22	29	05	12	19	26	05	12	19	26	02	09	16	23	30	07	14	21	28	04	11	18	25	02	09	16	23	30	06	13	20	27	03	10	17	24	01	08	15
Thu	17	24	31	07	14	21	28	05	12	19	26	02	09	16	23	30	06	13	20	27	06	13	20	27	03	10	17	24	01	08	15	22	29	05	12	19	26	03	10	17	24	31	07	14	21	28	04	11	18	25	02	09	16
Fri	18	25	01	08	15	22	29	06	13	20	27	03	10	17	24	31	07	14	21	28	07	14	21	28	04	11	18	25	02	09	16	23	30	06	13	20	27	04	11	18	25	01	08	15	22	29	05	12	19	26	03	10	17
Sat	19	26	02	09	16	23	30	07	14	21	28	04	11	18	25	01	08	15	22	01	08	15	22	29	05	12	19	26	03	10	17	24	31	07	14	21	28	05	12	19	26	02	09	16	23	30	06	13	20	27	04	11	18
Sun	20	27	03	10	17	24	01	08	15	22	29	05	12	19	26	02	09	16	23	02	09	16	23	30	06	13	20	27	04	11	18	25	01	08	15	22	29	06	13	20	27	03	10	17	24	31	07	14	21	28	05	12	19

(2x5 ECTS) Module 1, Module 2 | (2x5 ECTS) Module 3, Module 4 | (2x5 ECTS) Module 5, Module 6 | (2x5 ECTS) Module 7, Module 8 | (1x5 ECTS) Module 9 | (2x5 ECTS) Module 10, Module 11 | (1x5 ECTS) Module 12 | (2x5 ECTS) Module 13, Module 14

YEAR 2																											
	2014										2015																
	Oct	November				December					January				February				March					April			
Week	43	44	45	46	47	48	49	50	51	52	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17
Mon	20	27	03	10	17	24	01	08	15	22	29	05	12	19	26	02	09	16	23	02	09	16	23	30	06	13	20
Tue	21	28	04	11	18	25	02	09	16	23	30	06	13	20	27	03	10	17	24	03	10	17	24	31	07	14	21
Wed	22	29	05	12	19	26	03	10	17	24	31	07	14	21	28	04	11	18	25	04	11	18	25	01	08	15	22
Thu	23	30	06	13	20	27	04	11	18	25	01	08	15	22	29	05	12	19	26	05	12	19	26	02	09	16	23
Fri	24	31	07	14	21	28	05	12	19	26	02	09	16	23	30	06	13	20	27	06	13	20	27	03	10	17	24
Sat	25	01	08	15	22	29	06	13	20	27	03	10	17	24	31	07	14	21	28	07	14	21	28	04	11	18	25
Sun	26	02	09	16	23	30	07	14	21	28	04	11	18	25	01	08	15	22	01	08	15	22	29	05	12	19	26

Legend

- = Lecture period
- = Examination period
- = MSC thesis writing period
- = Holiday / free time period
- = Opening acad. year Oct 17, 2013
- = Diploma awarding:

Christmas:	25/26 Dec 2013
Good Friday:	18 Apr 2014
Easter:	20/21 April 2014
Kingsday:	**27 April** 2014 / **26**=party
Liberationday:	5 May 2014
Ascencion:	29 May 2014
Pentecost:	8/9 June 2014
Christmas:	25/26 Dec 2014
Good Friday:	3 April 2015
Easter:	5/6 April 2015

UNESCO-IHE
Institute for Water Education

Education and Examination Regulations for cohort 2013– 2015

For the Master Programmes in:

- Municipal Water and Infrastructure
- Environmental Science
- Water Management
- Water Science and Engineering

Approved by the Academic Board of UNESCO-IHE, 25 July 2013

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1 General Information

Article 1 Scope of the regulations

1.1 The present regulations apply to the education and examinations within the following Master programmes:

a. Municipal Water and Infrastructure
b. Environmental Science
c. Water Management
d. Water Science and Engineering

referred to hereafter as 'the programmes'.

The programmes are executed by the UNESCO-IHE Institute for Water Education, Delft, the Netherlands, referred to hereafter as 'the Institute' and several partner institutes in various countries.

1.2 In case a joint specialisation (see art. 3.1) leads to a double or joint degree, the rules and regulations of the partner institute will be applicable for those parts of the programme organised and implemented by the partner. Credit transfer agreements and all details of the programme offered by the partner institute are described in the agreements between UNESCO-IHE and the partner institute.

1.3 In case during the period 2013-2015 a double degree programme will be changed into a joint degree programme, the following articles are not applicable: art. 8.1b, 11,1, 25, 26, 27

Article 2 Definition of terms

2.1 The following terms are defined in the context of these regulations:

Act:	the Higher Education and Scientific Research Act (*Wet op Hoger Onderwijs en Wetenschappelijk Onderzoek*);
Module:	a self-contained programme unit with specified learning objectives, as stipulated in article 7.3 of the Act;
Rector:	the rector of the Institute;
ECTS:	the European Credit Transfer and Accumulation System;
Examination:	an interim study performance assessment for a component of the programme (in the Act: *tentamen*);
Constituent examination:	an examination consisting of a number of different parts (e.g. assignments, written or oral exams, presentations)
Examination board:	the committee as stipulated in article 7.12 of the Act;
Practical:	a practical educational activity as stipulated in article 7.13, paragraph 2, clause d of the Act, taking one of the following forms: • the writing of a report or thesis; • producing a report, study assignment or design; • conducting a test or experiment; • performing an oral presentation; • participating in groupwork, fieldwork or a fieldtrip; • conducting a research assignment; or • participation in other educational activities that aim to develop

specific skills.

Programme examination: the formal evaluation of the student performance before graduation (in the Act: *examen*);

Double degree programme: is a programme where the student sequentially works for two different university degrees, at different institutions. A student may earn two different degrees simultaneously.

Joint degree programme:
- are developed and/or approved jointly by several institutions;
- students from each participating institution study parts of the programme at other institutions;
- the students' stays at the participating institutions are of comparable length;
- periods of study and exams passed at the partner institution(s) are recognised fully and automatically;
- after completion of the full programme, the student obtains one degree awarded jointly by the partner institutes..

Student: a person who is registered in a study programme and sits examinations.

Mentor: staff member involved in the daily direction of a student during the MSc thesis research phase

Supervisor: professor responsible for the MSc research work of student.

Article 3 Programme and specialisations

3.1 The programmes are Master of Science programmes with the following specialisations:

Municipal Water and Infrastructure programme:

1. Water Supply Engineering:
   - at UNESCO-IHE, as well as jointly with
   - Kwame Nkrumah University of Science & Technology, Ghana, and
   - Universidad del Valle, Colombia;
2. Sanitary Engineering:
   - at UNESCO-IHE, as well as jointly with
   - Kwame Nkrumah University of Science & Technology, Ghana, and
   - Universidad del Valle, Colombia;
3. Urban Water and Management: a joint specialisation with the Asian Institute of Technology, Thailand.

Environmental Science programme:

1. Environmental Science and Technology;
   - at UNESCO-IHE, as well as jointly with
   - Universidad del Valle, Colombia;
2. Environmental Planning and Management;
3. Water Quality Management;
4. Limnology and Wetland Management: a joint specialisation with
   - BOKU - University of Natural Resources and Life Sciences, Vienna, Austria, and
   - Egerton University, Egerton, Kenya
5. Environmental Technology for Sustainable Development: a joint specialisation with the Asian Institute of Technology, Thailand;
6. Environmental Technology and Engineering (Erasmus Mundus programme).

Water Management programme:

1. Water Resources Management;
2. Water Services Management;
3. Water Quality Management; and
4. Water Conflict Management.

Water Science and Engineering programme:

1. Hydrology and Water Resources;
   - at UNESCO-IHE as well as jointly with
   - Hohai University, China P.R.;
2. Hydraulic Engineering - River Basin Development;
3. Hydraulic Engineering - Coastal Engineering and Port Development;
   - at UNESCO-IHE as well as jointly with
   - Hohai University, China P.R.;
4. Hydraulic Engineering - Land and Water development;
   - at UNESCO-IHE as well as jointly with
   - Sriwijaija University, Palembang, Indonesia;
   - Asian Institute of Technology Thailand;
   - Haramaya University, Ethiopia;
5. Hydroinformatics- Modelling and information systems for water management;
   - at UNESCO-IHE as well as jointly with
   - Hohai University, China P.R.;
   - Universidad del Valle, Colombia;
   - Ain Shams University, Egypt;
6. Ecohydrology (Erasmus Mundus programme); and
7. Flood Risk Management (Erasmus Mundus programme).

Article 4 Aim of the programme

4.1 The aim of the programmes is to convey to the students the knowledge, insight and skills that are required to function as independent professionals within their field of study and to be appropriate candidates for further study towards a research career.

4.2 The qualifications of the programme graduates are listed in Appendix A.

Article 5 Full-time/part-time

5.1 The programmes are executed on a full-time basis.

Article 6 Study load of the programme

6.1 The minimum study load of the programmes is 106 ECTS credit points, with reference to article 7.4a, paragraph 8 of the Act.

Article 7 Programme examination

7.1 Students in the programmes are eligible to sit the programme examination leading to the degree of Master of Science in the programme they are registered for.

7.2 The programme examination is passed if all designated examinations in the programme curriculum have been successfully completed (and in case of joint or double degree programmes have met the requirements of the partner institutes), as stipulated in article 7.10a, paragraph 1 of the Act.

2 Academic Admission Requirements

Article 8 Admission to the programmes

8.1 Academic admission to the programmes may be granted to applicants who provide evidence of having:

a. a university level Bachelor's degree in an appropriate field for the specialisation, as listed in Appendix B, and which has been awarded by a university of recognised standing.

b. some working experience in an environment related to the specialisation. At least three years experience is in general preferred.

c. a good command of the English language, if this is not the first language. This is measured by a minimum IELTS score of 6.0, a minimum paper-based TOEFL score of 550, or a minimum computer-based TOEFL score of 213 or a minimum internet based score of 79. For other tests, the results will be interpreted to show alignment with the Council of Europe's Common European Framework (CEF) levels C1 or C2.

8.2 Academic admission to the programmes will be granted on the basis of a decision taken to that effect by the Academic Registrar, upon advice of the appropriate programme coordinator.

3 Content of the Programme

Article 9 Composition of the specialisations and joint specialisations

9.1 The composition of each programme specialisation is described in the programme handbooks of UNESCO-IHE and the partner institutes, respectively (in case of joint or double degree programmes)

Article 10 Practicals and participation

10.1 The attendance and active participation of students is required for all scheduled curricular activities and the practicals of the programme specialisation in which they are registered.

4 Examinations

Article 11 Sequence of the examinations

11.1 Sequence of the examinations will take place according to the order as described the programme handbook.

Article 12 Periods and frequency of examinations

12.1 Students can sit each oral or written examination only two times per academic year, except where indicated in subsequent paragraphs.

12.2 The date and time allocations for the first sitting are announced in the programme schedules. Examinations take place during the examination periods indicated in the academic calendar.

12.3 Groupwork, fieldwork and fieldtrips are offered and assessed once per academic year.

12.4 Students are not allowed to re-sit (constituent parts of) module examinations for which a successful result has been obtained.

12.5 Written and oral re-examinations take place during the examination period following the initial examination period indicated in the academic calendar. The students involved are notified sufficiently in advance by email about the date and time allocation for re-examinations. Non or misreading emails are no excuse for not participating in an re-examination. All students will take the re-sit of a written examination at the same time.

12.6 All re-examinations have to be completed in the examination week immediately following module 12.

12.7 Notwithstanding the stipulations in article 11, paragraph 1 and article 12 paragraph 5, successful completion of the examinations is not required for sitting subsequent examinations.

12.8 Students will not be allowed to sit for further examinations and -assignments during the programme period they are registered for, if they failed three (3) or more different module re-examinations for the first 13 modules of the programme.

12.8 The maximum recorded module mark after a successful re-sit is limited to 6.0.

Article 13 The nature of the examinations

13.1 A module is assessed via (a combination of) written and/or oral examinations, assignments and presentations as indicated in the module descriptions.

13.2 In case of a combination of an oral and written examination of a module the maximum total duration of both examinations shall not exceed 3 hours.

13.3 A written examination has to take place in a period of max. 3 hours during a morning or afternoon session. In case examination work consists of two or more different parts, a break of 15 minutes during the examination is allowed, provided that all examination work of the first part(s) is collected by the invigilators.

13.4 Examinations are carried out according to the guidelines described in annex C of these regulations.

13.5 The format of the examinations for each module in each programme is described in the programme handbook.

13.6 The format of a re-examination may deviate from that of the first examination for the same module.

13.7 Re-examination proceeds by re-examining one or more failed constituent parts, as would be necessary to achieve a successful examination result.

13.8 The credits for successful completion of fieldwork and fieldtrips are granted on the basis of active participation, unless stated otherwise in the module sheet.

13.9 Students who suffer from a physical or sensory impairment are offered the opportunity to take part in an examination such that, as much as possible, account is taken of their disability. If required, an expert will be consulted for advice.

Article 14 Oral examinations

14.1 Oral examinations involve only one student at a time. During oral examinations, a second examiner has to be present as independent observer.

14.2 The examination of the thesis research is open to public attendance and discussion. All other oral examinations are non-public, unless stated otherwise in the module sheet.

Article 15 Exemptions and transfer of credit points

15.1 Exemptions to sit examinations are generally not granted. In specific cases, the examination board may evaluate a request and conclude a decision on transfer of credit points, after receiving a favourable recommendation from the programme committee.

15.2 For joint specialisations credits obtained at the partner institute are accepted on the basis of the credit transfer agreements made in the cooperation documents.

Article 16 Absence from examinations

16.1 Absence from an examination must be reported by the student to the programme coordinator as early as possible. Absence is only allowed if the student missed a substantial part of the education relevant for the examination and/or the examination itself due to:

a. medical reasons, to be confirmed by a medical note stating the inability to participate; or
b. serious circumstances beyond control of the student which should be supported by written evidence as far as possible.

16.2 For cases in which the programme coordinator, in agreement with the chair of the examination board, decides that the absence is justified the student shall sit the examination as soon as is reasonably possible.

16.3 For cases in which the programme coordinator, in agreement with the chair of the examination board, decides that the absence is not justified the result 1.0 will be recorded.

Article 17 Fraud

17.1 If a student is caught in an attempt to take unfair advantage during an examination, the invigilators or examiners will inform the Academic Registrar who will submit a written report to the examination board after investigation of the incident, and after having had a discussion with the student.

17.2 Plagiarism is a serious act of fraud.

17.3 An examiner who observes or suspects fraud during the assessment of examination work is required to submit a substantiating report to the examination board.

17.4 If the examination board, after investigation of the incident, concludes that there has been a case of fraud, the offender will be given the mark 1.0 for the examination work.

5 Results of Examinations

Article 18 Assessment and notice of examination results

18.1 Examination assessment results (including the thesis examination) are represented on a scale of 1.0 to 10.0, with one decimal of accuracy. Marks 6.0 and higher indicate a successful result.
The following grading scale is used:

9.0 - 10.0	Excellent
8.0 - 8.9	Very good
7.0 - 7.9	Good
6.0 - 6.9	Sufficient
5.9 and below	Fail

18.2 Examination assessment results (including the thesis examination) obtained at partner institutes are represented according to the descriptions in annex D of these regulations.

18.3 The mark for a constituted examination is determined by the weighted average of the results of the constituent parts. The weights for the constituent parts are stated in the module sheet.

18.4 As a rule the examiner shall assess a written examination or practical paper within a period of 14 days after the date of the examination.

18.5 All written examination work of the students will, where reasonably feasible, be blind corrected by the examiners involved.

18.6 The examiner shall determine the result of an oral examination shortly after the examination has been conducted.

18.7 The examination committee for the thesis examination shall determine the result after the defence. The mark shall be formally communicated to the student before the diploma awarding by the Education Bureau

18.8 Examiners inform the module coordinators about the results of all examinations (written and oral) via standard examination result forms. Subsequently the module coordinators inform the Education Bureau via standard forms about the final module mark.

18.9 As a rule examination results shall be collected, processed, recorded and notified to the students by the Education Bureau within a period of 21 days after submission of the examination work by the student.

18.10 For each examination, the student receives a written statement from the Education Bureau of the examination result obtained for the module and, if successful, the associated credit points granted for that module.

Article 19 Period of validity

19.1 The result of an examination, when successful, is valid for an unlimited period of time.

19.2 Notwithstanding paragraph 1 of this article, the period of validity for which the examination board takes examination results into account for the programme examination is four years.

Article 20 Right to inspection of assessments

20.1 Students may, upon their own request, peruse their assessed written examination work within ten working days after they were notified of the examination result.

20.2 Where a practical forms part of an examination, the work for that part may be returned to the students after the full assessment of the examination is completed.

20.3 Written examination work is kept in archive for a minimum of 6 years.

6 Thesis Examinations

Article 21 Organisation of thesis examinations

21.1 The thesis will be assessed by a thesis examination committee, normally consisting of three (3) members: a professor as chairperson, the mentor and an external examiner. In special circumstances the committee may consist of more than three members. In case a PhD fellow, who is mentoring MSc students in his/her own research, is proposed as member of the committee, a fourth additional staff member is compulsory. External examiners are normally from outside the institute or in incidental cases from a chair group within the institute not involved in the supervision of the research work. In case of a double degree or joint degree programme, where the MSc research work is carried out under supervision of staff members of the partnering institutes, the examination committee may consist of more than three (3) members.

21.2 The opportunity to sit the thesis examination is offered once every calendar month.

21.3 All students have to submit the examination version of the thesis report on the same date, i.e. the second Thursday of the month of the thesis examination.

21.4 Admission to the thesis examination is granted when the supervisor, upon recommendation of the mentor, has approved the draft thesis; in other words, the draft thesis needs to be approved as ‘ready for the MSc defence’.

21.5 Students can sit the thesis examination only if all other examinations of the programme specialisation curriculum have been successfully completed.

21.6 In exceptional cases, when the outcome of the thesis examination, including the defence, was negative, the examination can be repeated once. The supervisor and mentor will detail the reasons for the failure in writing and clarify what is required to pass the exam. The student has to finalise the work without further supervision and financial support.
The re-sit shall be taken within three months after the first attempt and will in principle be assessed by the same committee as for the first attempt.
In special circumstances the examination can take place via videoconference.

21.7 The maximum mark for a re-sit of the thesis examination is 6.0.

21.8 The MSc thesis work shall be assessed according to the MSc thesis assessment criteria as outlined in appendix F.

21.9 The mark for the thesis examination is based on the following components: written MSc thesis report, presentation and discussion. The latter includes the ability of the student to answer questions from the examination committee and the audience.

21.10 The maximum duration of the MSc research phase is 6 months for a full time study. Extension of this period may be granted on request by the student and is subject to approval by the rector, upon advice from the Examination Board.

Article 22 Study progress and study advice

22.1 All study results that are required for evaluating the performance of the students, and the evaluation results are recorded on behalf of the Academic Board.

22.2 Upon request, students will be provided with a written summary of the study results obtained in the programme to date.

7 Examination Board

Article 23 Examination board procedures

23.1 The examination board is a sub-board of the Academic Board and normally meets before the monthly meeting of the Academic Board. The calendar of meetings is established and circulated at the beginning of the academic year. Additional meetings will be set or meetings can be rescheduled whenever circumstances dictate.

23.2 For each meeting, the administrative secretary will provide all required material to properly conduct the examination board's deliberations.

23.3 Decisions of the examination board are concluded by majority vote.

23.4 The mandate of the examination board is defined by its Terms of Reference.

Article 24 Assessment of the programme examination

24.1 The student has fulfilled the requirements for the programme examination if (s)he has:

- For the single UNESCO-IHE degree programmes (excluding ES-LWM):
  - Successfully completed all examinations of the programme; and
  - Obtained a minimum of 106 ECTS.

- For the joint degree Limnology and Wetland Management programme (LWM):
  - Successfully completed all examinations of the programme, according to the grading rules of BOKU, Egerton University and UNESCO-IHE; and
  - Obtained a minimum of 120 ECTS.

- For the joint degree International Master of Science in Environmental Technology and Engineering programme (IMETE):
  - Successfully completed all examinations of the programme, according to the grading rules of Ghent University, Institute of Chemical Technology in Prague and UNESCO-IHE; and
  - Obtained a minimum of 120 ECTS.

- For the double degree programmes conducted with the Asian Institute of Technology (AIT):
  - Obtained a GPA of 2.75 or higher for the course work done at AIT; and
  - Successfully completed all module examinations at UNESCO-IHE; and
  - Achieved a grade of, excellent, very good, good or fair for the thesis examination; and
  - Obtained a minimum of 120 ECTS (UWEM, AWELWP), or 125 ECTS (ETSuD).

- For the double degree programmes conducted with Universidad del Valle:
  - Obtained a GPA of 3.5 or higher for the course work done at Univalle; and
  - Successfully completed all module examinations at UNESCO-IHE; and
  - Achieved a pass for the thesis examination; and
  - Obtained a minimum of 120 ECTS.

- For the double degree programmes conducted with KNUST:
  - Obtained a CWA of 55% or higher for the course work done at KNUST; and
  - Successfully completed all module examinations at UNESCO-IHE; and
  - Achieved a pass for the thesis examination; and
  - Obtained a minimum of 118 ECTS.

- For the double degree programme conducted with Sriwijaija University:
  - Successfully completed all examinations of the programme; and
  - Obtained a minimum of 106 ECTS.

- For the multiple degree programme on Flood Risk Management:
  - Successfully completed all examinations of the programme, according to the grading rules of TU-Dresden, University of Ljublijana, TU-Catalonia and UNESCO-IHE; and
  - Obtained a minimum of 120 ECTS.

- For the double degree programme conducted with Haramaya University:
  - Obtained a pass mark of 2.5 or higher for the course work done at Haramaya; and
  - Successfully completed all module examinations at UNESCO-IHE; and
  - Achieved a pass for the thesis examination; and
  - Obtained a minimum of 112 ECTS.

- For the multiple degree programme in Ecohydrology:
  - Successfully completed all examinations of the programme, according to the grading rules of the University of Lodz, University of Algarve, University of Kiel, University of La Plata and UNESCO-IHE; and
  - Obtained a minimum of 120 ECTS.

24.2 The student has successfully completed the programme examination when the examination board takes a decision to that effect.

Article 25 Degree awarding

25.1 Students who have successfully completed the programme examination will be awarded the Master of Science degree at the next scheduled degree awarding ceremony.

25.2 Based on a recommendation of the MSc thesis examining committee to the Examination Board, the degree can be recommended to be awarded with distinction, if the candidate obtained a mark of 8.5 or higher for the thesis examination and an arithmetic average mark at UNESCO-IHE of 8.0 or higher for all other examinations in the programme that are assessed on a numerical scale, conform article 2.1.
If some credit points for the taught and thesis components are earned at a partner institute, a motivating letter from the chair of the thesis examining committee is needed that justifies the recommendation to award of a MSc degree with distinction.

Article 26 Degree certificate and supplement

26.1 As evidence of successful completion of the programme examination, the Examination Board issues a degree certificate during the awarding ceremony. The degree is signed by the Chairman of the Examination Board, the Rector of the Institute and the Academic Registrar.

26.2 In addition to the degree certificate, the graduate receives a degree supplement stating the results achieved and credit points for each component of the programme.

Article 27 Programme certificate

27.1 Students who fail to meet the programme examination requirements, or who suspend or terminate their registration, will be issued a certificate stating the result achieved and credit points for each successfully completed component of the programme, and the period of registration.

27.2 Students who fail to meet the programme examination requirements and have accumulated a minimum of 45 credits will be awarded a certificate of post-graduate study in the programme for which they are registered. Registration as student will be terminated.

8 Appeals

Article 28 Grounds for appeal

28.1 Students have the right to appeal against an examination assessment or an evaluation of the examination board within a period of ten working days after notification, if

a. the performance of the student suffered through illness or other factors;
b. a material administrative error in the conduct of an examination or assessment had occurred;
c. the examination or evaluation was not conducted in accordance with the regulations; or
d. some other material irregularity had occurred.

Article 29 Procedure for appeal

29.1 A student shall first attempt to resolve the problem through the programme coordinator, with the examiner, or the chairman of the examination committee or examination board.

29.2 If the student proceeds, the appeal shall be written in a letter stating the grounds for appeal and enclosing documentation as appropriate. The letter shall be addressed to the Rector.

29.3 The Rector shall accept or reject the appeal (after consultation with the examination board) and communicate the decision to the appellant via the Academic Registrar as soon as possible but usually within a period of ten working days.

9 Final Articles

Article 30 Amendments

30.1 Amendments to these regulations are made by separate decision of the Academic Board.

30.2 No amendments shall be made in relation to the current academic year, unless there is reasonable expectation that the amendment will not work to the disadvantage of the students.

Article 31 Unforeseen situations

31.1 Situations which are not foreseen by the present regulations will be decided on by the Academic Board, where necessary after consultation with the examination board and/or programme committees.

Article 32 Publication

32.1 The Academic Board is responsible for the timely publication of the Education and Examination Regulations, and any amendments thereof.

Article 33 Period of application

33.1 These regulations take effect for the cohort 2013– 2015. Approved by the Academic Board of UNESCO-IHE on 25 July 2013.

Appendix A Qualifications of Graduates

Municipal Water and Infrastructure Programme

Sanitary Engineering

After successful completion of the programme graduates will be able to:

Knowledge and Theory

1. Apply gained knowledge and skills in practice;

2. Understand and explain the role of sanitation in urban water cycle and its relation to public health and environment;

3. Develop rational approaches towards sustainable waste(water) management via pollution prevention, appropriate treatment, resources recovery and re-use on both centralized and decentralized level;

4. In-depth understand relevant physical, chemical and biological processes, and their mutual relationships within various sanitation components.

Methods, Techniques and Tools

5. Prepare conceptual engineering and process design of sanitation components;

6. Apply modern tools for technology selection and carry out modelling of sanitation components;

Analysis, Synthesis and Integration

7. Define and critically analyse, assess and evaluate various urban drainage and sewerage schemes, and wastewater, sludge and solid waste treatment process technologies;

8. Analyse, synthesise, integrate, interpret, and discuss both scientific and practical information in the context of various research and engineering projects including preparation of Master plans, feasibility studies and preliminary designs;

Research

9. Identify, develop and conduct independent research including formulation of hypotheses selection and application of research methodologies, and the formulation of conclusions and recommendations;

10. Carry on desk studies, field work, and laboratory based research;

11. Contribute to the development of innovative approaches to the provision of adequate and sustainable sanitation services in developing countries and countries in transition;

General Academic Skills

12. Clearly communicate concerning both oral and written skills;

13. Continuously acquire knowledge and assimilate and implement innovative learning methods and skills in an independent manner;

14. Operate both autonomously and in a multidisciplinary and multinational environment.

Water Supply Engineering

After successful completion of the programme graduates will be able to:

Knowledge and Theory

1. Have understanding of the structure of drinking water supply systems, including water transport, treatment and distribution;

2. Have understanding of water quality criteria and standards, and their relation to public health, environment and urban water cycle;

3. Have in-depth understanding of occurring physical, chemical and biological phenomena and their mutual relationships, within water supply systems;

4. Have understanding of water quality concepts and their effect on treatment process selection;

5. Have understanding of the interaction of water quality and materials applied;

6. Have understanding of hydraulic concepts and their relationship to water transport in treatment plants, pipelines and distribution networks;

Methods, Techniques and Tools

7. to design and to rehabilitate raw water abstraction, transport, treatment and distributionprocesses and systems;

8. Understand the importance and methods for operation and maintenance of water supply systems;

9. Understand options for centralised and urban systems versus decentralized and rural systems;

Analysis, Synthesis and Integration

10. define and evaluate project alternatives on basis of chosen selection criteria;

11. use statistical and modelling tools for simulating, prediction of performance and operation of water supply system components;

12. Understand water supply engineering within a watershed context

Research

13. conduct independent research, including formulation of hypotheses, selection and application of research methodologies, and the formulation of conclusions and recommendations;

General Academic Skills

14. Posses the learning skills to acquire continual knowledge in an independent manner;

15. communicate effectively in oral and written presentations to technical and non-technical audiences.

Urban Water Engineering and Management

After successful completion of the programme graduates will be able to:

Subject knowledge and skills

1. understand the urban water cycle and its water system components, their characteristics and functioning within greater urban infrastructure systems;

2. understand urban water management problems including ability to: identify water systems' demand; deal with climatic and hydrologic uncertainties and/or extremes; institutional limitations; and work within a data-constrained environment;

3. make appropriate and critical use of methods, techniques and tools necessary to monitor, analyze and design urban water systems including: water supply infrastructure; drinking water treatment and distribution; wastewater collection, treatment, transport and disposal systems; drainage systems;

4. understand water infrastructure/asset planning, financing and management, and utility management;

5. familiarity with the concept of integrated water resources management (IWRM) and its application to a variety of water management problems at the urban catchment scale;

Core academic skills

6. identify, articulate, analyse and solve problems of the urban water cycle and systems, integrating theory and applications;

7. collect, summarise, analyse and interpret technical data/materials in a structured form to gain knowledge on urban water system design and operation and maintenance;

8. critically recognize and assess the need for continued-education and research on planning, design, maintenance and management of urban water systems;

9. have a working knowledge of a range of information technology tools available for solving urban water management problems and for effectively communicating with fellow water managers, researchers, scientists, planners, and policy-makers;

Personal skills

10. Improved skills for independent learning;

11. enhanced reporting and presentation skills;

12. improved IT skills;

13. work independently or as part of a team;

14. manage time effectively.

Environmental Science Programme

Environmental Science & Technology

After successful completion of the programme, graduates will be able to:

Knowledge & theory

1. demonstrate knowledge and understanding of the physical, chemical and biological processes of the environment, of the socio-economic concepts underlying the functioning and exploitation of environmental systems, and of the complex inter-relationship between the protection and wise use of environmental resources;

2. describe the rationale for an integrated and interdisciplinary approach for the sustainable management of water and environmental resources;

3. identify the impacts of human activities on the environment, under different levels of environmental stress and in different socio-economic contexts;

4. name and explain concepts, instruments and technologies for pollution prevention and remedial actions in a national and international context;

Methods, techniques & tools

5. design, optimise and interpret environmental monitoring and assessment schemes (including statistics and modelling) in order to gain an understanding of problems, trends, causes and effects;

6. apply general methods (including statistics and modelling) in scientific and technological approaches, concepts and interventions;

7. contribute as a flexible and creative member in interdisciplinary teams in developing solutions for prevention or remediation of environmental problems, by linking scientific knowledge to engineering interventions and to management decisions in different cultural and socio-economic contexts, and using different levels of available knowledge and information;

Analysis, synthesis & integration

8. critically analyse and evaluate a range of options and alternatives for the prevention or remediation of environmental problems, under different socio-economic, cultural and legal contexts, and under often data-poor conditions;

Research/General academic skills

9. conduct research, independently or in a multidisciplinary team, including the formulation of research questions and hypotheses, the selection and application of research methodologies and techniques and the formulation of well-founded conclusions and recommendations;

10. communicate, debate and defend, clearly and systematically, findings and generated insights, and provide rational underpinning of these in oral and written presentations to a variety of audiences;

11. demonstrate academic attitude and learning skills (including thinking in multidisciplinary dimensions and distinguishing main issues from minor ones), to enhance and keep up-to-date the acquired knowledge and application skills in a largely independent manner.

Environmental Planning & Management

After successful completion of the programme, graduates will be able:

Knowledge & theory

1. to demonstrate knowledge and understanding of the physical, chemical and biological processes of the environment, of the socio-economic concepts underlying the functioning and exploitation of environmental systems, and of the complex inter-relationship between the protection and wise use of environmental resources;

2. to describe the rationale for an integrated and interdisciplinary approach for the sustainable management of water and environmental resources;

3. to understand the environmental policy cycle and planning process and to analyse and prepare environmental policy strategies, taking into account the impact that society has on water and environmental resources;

4. to name and explain principles, concepts and instruments of major national and international water and environmental legislation and common and desired institutional and management arrangements;

Methods, techniques & tools

5. to design, optimise and interpret environmental monitoring and assessment schemes (including statistics and modelling) in order to gain an understanding of problems, trends, causes and effects;

6. to apply general scientific methods (including statistics and environmental modelling) to processes of water and environmental resources allocation and use at different scales in order to gain an understanding of problems, trends, causes and effects;

7. to apply environmental scientific methods (including environmental impact assessment, policy analysis, resource valuation, environmental economics) and models for institutional development with emphasis on policy development, functional decentralisation and good governance;

8. to design and facilitate consultation- and decision-making processes between stakeholders, users and their representatives, water managers, politicians and other decision-makers;

Analysis, synthesis & integration

9. to critically analyse and evaluate a range of options and alternatives for the prevention or remediation of environmental problems, under different socio-economic, cultural and legal contexts, and under often data-poor conditions;

10. to identify and critically assess the different ecological and socio-economic functions and values of the environmental system and the, often competing, interests of the various stakeholders;

Research/General academic skills

11. to conduct research, independently or in a multidisciplinary team, including the formulation of research questions and hypotheses, the selection and application of research methodologies and techniques and the formulation of well-founded conclusions and recommendations;

12. to communicate, debate and defend, clearly and systematically, findings and generated insights, and provide rational underpinning of these in oral and written presentations to a variety of audiences;

13. to demonstrate academic attitude and learning skills (including thinking in multidisciplinary dimensions and distinguishing main issues from minor ones), to enhance and keep up-to-date the acquired knowledge and application skills in a largely independent manner;

14. to design comprehensive environmental resources policies and strategies that aim to enhance the sustainable use of the environment especially focusing on water, and that include a suitable combination of technical, legal, administrative and financial measures.

Water Quality Management

After successful completion of the programme, graduates will be able to:

Knowledge & theory

1. demonstrate knowledge and understanding of the physical, chemical and biological processes of the environment, of the socio-economic concepts underlying the functioning and exploitation of environmental systems, and of the complex inter-relationship between the protection and wise use of environmental resources;

2. describe the rationale for an integrated and interdisciplinary approach for the sustainable management of water and environmental resources;

3. identify the impacts of human activities on aquatic ecosystems;

4. name and explain principles, concepts and instruments of main national and international water and environmental legislation and common and desired institutional and management arrangements;

Methods, techniques & tools

5. design, optimise and interpret environmental monitoring and assessment schemes (including statistics and modelling) in order to gain an understanding of problems, trends, causes and effects;

6. interpret, design and optimise water quality monitoring and assessment schemes in the watershed;

7. apply experimental, statistical and modelling tools for interpreting and designing water quality management programmes;

Analysis, synthesis & integration

8. critically analyse and evaluate a range of options and alternatives for the prevention or remediation of environmental problems, under different socio-economic, cultural and legal contexts, and under often data-poor conditions;

9. contribute as a flexible and creative member in interdisciplinary teams in developing solutions for water quality management problems in different cultural and socio-economic contexts, and using different levels of available knowledge and information;

10. critically analyse and evaluate alternative water quality management programmes in the watershed under different socio-economic and legal contexts, often in data-poor conditions;

Research/General academic skills

11. conduct research, independently or in a multidisciplinary team, including the formulation of research questions and hypotheses, the selection and application of research methodologies and techniques and the formulation of well-founded conclusions and recommendations;

12. communicate, debate and defend, clearly and systematically, findings and generated insights, and provide rational underpinning of these in oral and written presentations to a variety of audiences;

13. demonstrate academic attitude and learning skills (including thinking in multidisciplinary dimensions and distinguishing main issues from minor ones), to enhance and keep up-to-date the acquired knowledge and application skills in a largely independent manner.

Limnology & Wetland Ecosystems

After successful completion of the programme, graduates will be able to:

1. Knowledge and understanding:

- knowledge and understanding of the physical, chemical and biological processes of the environment, of the socio-economic concepts underlying the functioning and exploitation of environmental systems, and of the complex inter-relationship between the protection and wise use of environmental resources;
- describe how hydrology, morphology and aquatic organisms relate to biochemical processes and ecological functions of inland aquatic ecosystems;
- summarise provisioning and regulating ecosystem services provided by inland surface waters and wetlands;
- identify the impacts of human activities on freshwater ecosystems in different socio-economic contexts;
- demonstrate knowledge and understanding of the international water quality guidelines;

2. Applying knowledge and understanding:

- think critically in evaluation of results, information derived from the literature and other sources, and for problem-solving of complex issues related to aquatic ecosystems;
- apply general scientific methods (including statistics and environmental modelling) for the development and application of scientific and technological approaches, concepts and interventions to address environmental problems of freshwater ecosystems;
- design sampling strategies for the cost-effective monitoring of aquatic ecosystems, that can support and inform policy objectives;
- produce a wetland management plan.

3. Making judgements:

- critically analyse and evaluate a range of options and alternatives for the prevention or remediation of environmental problems related to freshwater ecosystems, under different socio-economic and legal contexts, and under often data-poor conditions;
- evaluate anthropogenic impacts on rivers, lakes and wetlands in both temperate and tropical settings;
- evaluate the usefulness of wetlands as treatment systems of waste water;
- collate stakeholder views and integrate potentially conflicting objectives for the efficient and sustainable use of lakes, rivers and wetlands using concepts of an environmental management system, including management objectives for realistic action plans.

4. Communication:

- competence to clearly report and orally communicate results, the underpinning reasoning, knowledge and assumptions;
- work effectively in an interdisciplinary team and to present evidence-based arguments to a variety of audiences.

5. Learning skills:

- effectively plan, organise and conduct a research project that has clear aims and objectives;
- apply knowledge and scientific skills in international and multicultural teams and different socio-cultural environments;
- ability to extend and enhance the own knowledge, insight and skills in an autonomous manner;

Environmental Technology for Sustainable Development

After successful completion of the programme, graduates will be able to:

Knowledge & theory

1. demonstrate knowledge and understanding of the physical, chemical and biological processes of the environment, of the socio-economic concepts underlying the functioning and exploitation of environmental systems, and of the complex inter-relationship between the protection and wise use of environmental resources;

2. describe the rationale for an integrated and interdisciplinary approach for the sustainable management of water and environmental resources;

3. identify the impacts of human activities on the environment, under different levels of environmental stress and in different socio-economic contexts;

4. name and explain concepts, instruments and technologies for pollution prevention and remedial actions in a national and international context;

Methods, techniques & tools

5. design, optimise and interpret environmental monitoring and assessment schemes (including statistics and modelling) in order to gain an understanding of problems, trends, causes and effects;

6. apply general methods (including statistics and modelling) in scientific and technological approaches, concepts and interventions;

7. contribute as a flexible and creative member in interdisciplinary teams in developing solutions for prevention or remediation of environmental problems, by linking scientific knowledge to engineering interventions and to management decisions in different cultural and socio-economic contexts, and using different levels of available knowledge and information.

Analysis, synthesis & integration

8. critically analyse and evaluate a range of options and alternatives for the prevention or remediation of environmental problems, under different socio-economic, cultural and legal contexts, and under often data-poor conditions;

Research/General academic skills

9. conduct research, independently or in a multidisciplinary team, including the formulation of research questions and hypotheses, the selection and application of research methodologies and techniques and the formulation of well-founded conclusions and recommendations;

10. communicate, debate and defend, clearly and systematically, findings and generated insights, and provide rational underpinning of these in oral and written presentations to a variety of audiences;

11. demonstrate academic attitude and learning skills (including thinking in multidisciplinary dimensions and distinguishing main issues from minor ones), to enhance and keep up-to-date the acquired knowledge and application skills in a largely independent manner.

International Master of Science in Environmental Technology and Engineering

After successful completion of the programme, graduates will be able to:

Knowledge & theory

1. demonstrate knowledge and understanding of the physical, chemical and biological processes of the environment, of the socio-economic concepts underlying the functioning and exploitation of environmental systems, and of the complex inter-relationship between the protection and wise use of environmental resources;

2. describe the rationale for an integrated and interdisciplinary approach for the sustainable management of water and environmental resources;

3. identify the way polluted water, waste, gas, soils and sediments can be treated;

4. identify the way ecosystems and the atmosphere can be protected from pollution;

5. identify the way to prevent environmental pollution through resource management and application of re-use technologies;

Methods, techniques & tools

6. design, optimise and interpret environmental monitoring and assessment schemes (including statistics and modelling) in order to gain an understanding of problems, trends, causes and effects;

7. develop, design and apply technologies for the prevention and remediation of environmental pollution by searching scientific information, by conducting scientific research in the field of environmental technology and engineering and by reporting their findings by means of scientific reports and papers;

8. communicate effectively in English and transferring knowledge to both the scientific and non-scientific world through oral presentations and media communications.

Analysis, synthesis & integration

9. critically analyse and evaluate a range of options and alternatives for the prevention or remediation of environmental problems, under different socio-economic, cultural and legal contexts, and under often data-poor conditions;

10. demonstrate creativity and critical, multidisciplinary thinking for problem-solving and decision-making;

11. demonstrate responsibility and own initiative;

12. demonstrate capacity to work in an international, multi-cultural team.

Research/General academic skills

13. conduct research, independently or in a multidisciplinary team, including the formulation of research questions and hypotheses, the selection and application of research methodologies and techniques and the formulation of well-founded conclusions and recommendations;

14. communicate, debate and defend, clearly and systematically, findings and generated insights, and provide rational underpinning of these in oral and written presentations to a variety of audiences;

15. demonstrate academic attitude and learning skills (including thinking in multidisciplinary dimensions and distinguishing main issues from minor ones), to enhance and keep up-to-date the acquired knowledge and application skills in a largely independent manner.

Water Management Programme

Water Resources Management

After successful completion of the programme, graduates will be able to:

Knowledge & theory

1. Be able to describe and predict for a given water resources system the main hydrological, hydraulic, chemical and ecological processes and how these processes are dynamically linked with human activities, including land and water use.

2. Be able to describe and explain the main concepts and instruments for analysing and influencing formal and informal arrangements over water, including policies, laws and institutions, and by adopting a historical perspective.

3. Be able to explain the key concepts for integrated, multi-disciplinary and interdisciplinary analyses of water systems and describe the challenges of such approaches.

4. Be able to describe different concepts to determine the value of water for various uses and users in (amongst others) economic and social terms and explain how these concepts can be used in water resources planning at various spatial and temporal scales

Methods, techniques & tools

5. Be able to model processes of the water system (rainfall-runoff, flooding, water allocation, water accounting), validate models, critically interpret model outcomes in order to derive insight in trends, causes and effects, and define and explain model limitations.

6. Be able to formulate and critically evaluate governance frameworks related to water resources management and apply tools for policy analysis with the emphasis on social inclusion and sustainability.

7. Be able to combine different types of method and through a process of triangulation synthesize outcomes in a coherent manner.

Analysis, synthesis & integration

8. Be able to define a given water resources system, and compose the water flows across time and space, including the various water uses, and describe the interdependencies these create between the various water users.

9. Be able to critically evaluate technical and/or institutional water resources interventions (projects/ programmes/ policies/ agreements) through analysis of implications for the water resources system, its users and their interrelations at various spatial and temporal scales.

Research

10. Be able to conduct, independently or in a multidisciplinary team, research including the formulation of research questions and hypotheses, the selection and application of adequate research methodologies and techniques and the formulation of well-founded conclusions, recommendations and limitations.

General academic skills

11. Be able to clearly and systematically communicate, argue and defend findings in oral and written presentations to a variety of audiences.

12. Think in multidisciplinary and integrated dimensions and be able to distinguish main issues from side issues.

13. Have the academic attitude and learning skills to enhance and keep up-to-date the acquired knowledge and application skills in a largely independent manner.

Water Conflict Management
After successful completion of the programme, graduates will be able to:

Knowledge & theory

1. describe for a given water resources system the interplay between the main biophysical processes and social dynamics, in analyzing, anticipating, preventing and managing conflicts.

2. describe and explain the main concepts and instruments for analysing and influencing formal and informal arrangements over water for collaboration, including policies, laws and institutions, and by adopting a historical perspective.

3. explain the key concepts for integrated, multi-disciplinary and interdisciplinary analyses of water systems and describe the challenges of such approaches at sector, intersectoral and transboundary levels.

4. name and critically discuss theories, concepts and tools of conflict management and cooperation building techniques in the context of natural resources and water in particular.

Methods, techniques & tools

5. design and facilitate inclusive consultation and conflict management processes, such as consensus building, public participation, negotiation and mediation between actors at different levels.

6. formulate and critically evaluate governance frameworks related to water conflict management and apply tools for policy analysis with the emphasis on social inclusion and sustainability.

7. do combine different types of method and through a process of triangulation synthesize outcomes in a coherent manner.

Analysis, synthesis & integration

8. define a given water resources system, assess the different functions of the water resources system and the often competing interests of water using sectors and actors, describe the interdependencies between these, and finally assess the possibilities and limitations of cooperation.

9. critically evaluate technical and/or institutional interventions focused on conflict management (projects/ programmes/ policies/ agreements) through analysis of implications for the water resources system, its users and their interrelations at various spatial and temporal scales.

Research

10. conduct, independently or in a multidisciplinary team, research including the formulation of research questions and hypotheses, the selection and application of adequate research methodologies and techniques and the formulation of well-founded conclusions, recommendations and limitations.

General academic skills

11. clearly and systematically communicate, argue and defend findings in oral and written presentations to a variety of audiences.

12. think in multidisciplinary and integrated dimensions and be able to distinguish main issues from side issues.

13. have the academic attitude and learning skills to enhance and keep up-to-date the acquired knowledge and application skills in a largely independent manner.

Water Quality Management
After successful completion of the programme, graduates will be able to:

Knowledge and theory

1. describe and predict for a given water resources system the main hydrological, hydraulic, chemical and biological processes and how these processes are dynamically linked with aquatic ecosystems as well as with human activities such as land and water use and pollution.

2. describe and explain the main concepts and instruments for analysing and influencing formal and informal arrangements for water quality management, including policies, laws and institutions, and by adopting a historical perspective.

3. explain the key concepts for integrated, multi-disciplinary and interdisciplinary analyses of aquatic ecosystems and describe the challenges of such approaches.

4. describe concepts to determine the value of water for various uses and users in (amongst others) economic and ecological terms and explain how these concepts can be used in water resources planning at various spatial and temporal scales.

Methods, techniques and tools

5. interpret, design and optimize water quality assessment and monitoring programmes by applying experimental, statistical and modelling tools.

6. formulate and critically evaluate governance frameworks related to water quality management and apply tools for policy analysis with the emphasis on social inclusion and sustainability.

7. combine different types of method and through a process of triangulation synthesize outcomes in a coherent manner.

Analysis, synthesis and integration

8. define a given water resources system, and compose the water and pollution flows across time and space, including the various water uses, and describe the interdependencies these create between the various water users.

9. critically evaluate technical and/or institutional interventions focused on water quality (projects/ programmes/ policies/ agreements) through analysis of implications for the water resources system, its users and their interrelations at various spatial and temporal scales.

Research

10. conduct, independently or in a multidisciplinary team, research including the formulation of research questions and hypotheses, the selection and application of adequate research methodologies and techniques and the formulation of well-founded conclusions, recommendations and limitations.

General academic skills

11. clearly and systematically communicate, argue and defend findings in oral and written presentations to a variety of audiences.

12. think in multidisciplinary and integrated dimensions and be able to distinguish main issues from side issues.

13. have the academic attitude and learning skills to enhance and keep up-to-date the acquired knowledge and application skills in a largely independent manner

Water Services Management
After successful completion of the programme, graduates will be able to:

Knowledge and theory

1. Be able to describe for a given water resources system the interplay between the main biophysical processes and social dynamics, in analyzing service delivery modalities.

2. Be able to describe and explain the main concepts and instruments for analysing and influencing formal and informal arrangements concerning water supply and sanitation services, including policies, laws and institutions, and by adopting a historical perspective.

3. Be able to explain the key concepts for integrated, multi-disciplinary and interdisciplinary analyses of water services management and describe challenges of providing water supply and sanitation services at different levels (from global to local).

4. Be able to summarize the current debates relevant for water supply and sanitation services, using institutional and management theories from different academic disciplines (e.g. economics, public administration, sociology, political science, law).

Methods, techniques and tools

5. Design and apply analytical tools to research issues of water services management and describe, modify and apply management tools (e.g. with the benchmarking, cost benefit analysis, management information systems) with the aim of improving water supply and sanitation provision.

6. Be able to formulate and critically evaluate governance frameworks related to water services management and apply tools for policy analysis with the emphasis on social inclusion and sustainability.

7. Be able to combine different types of method and through a process of triangulation synthesize outcomes in a coherent manner.

Analysis, synthesis and integration

8. Be able to analyze and evaluate governance processes and utility management arrangements in the water services sector, integrating technical, legal administrative, social and financial components.

9. Be able to critically evaluate technical and/or institutional interventions (projects/ programmes/ policies/ agreements) through analysis of implications for water supply and sanitation services, its users and their interrelations at various spatial and temporal scales.

Research

10. Be able to conduct, independently or in a multidisciplinary team, research including the formulation of research questions and hypotheses, the selection and application of adequate research methodologies and techniques and the formulation of well-founded conclusions, recommendations and limitations.

General academic skills

11. Be able to clearly and systematically communicate, argue and defend findings in oral and written presentations to a variety of audiences.

12. Think in multidisciplinary and integrated dimensions and be able to distinguish main issues from side issues.

13. Have the academic attitude and learning skills to enhance and keep up-to-date the acquired knowledge and application skills in a largely independent manner.

Water Science and Engineering Programme

Hydraulic Engineering and River Basin Development

After successful completion of the programme graduates will be able to:

1. have in-depth understanding of physical processes and natural phenomena in river basin systems, development of river basins by human interference, such as designing river structures and training works, and the management of floods and droughts;

2. master the major hydraulic methodologies and applications for river structures and river modelling techniques with regard to techniques for data collection, processing and analysis;

3. evaluate and analyse river basin systems and processes at a wide range of scales for the purpose of water resources, including morphological assessments, impact analysis of hydraulic structures and natural hazards assessment and mitigation taking into account relevant aspects of environmental, economical and social planning and management;

4. design and conduct hydraulic research, experiments and tests for both practical and scientific purposes, either independently or within a team-based framework; by intelligent use of engineering and scientific principles, develop and undertake critical evaluations of strategies for the implementation of river engineering works;

5. have knowledge of contemporary research (questions) and relevant literature in the field of hydraulic engineering and river basin development;

6. critically judge and evaluate their own work and results, as well as the information of prior research or investigations;

7. adequately communicate methodologies, results, evaluations, conclusions and recommendations in written, oral and graphical form to a wide variety of audience;

8. be aware of the importance of hydraulic engineering to society and be able to co-operate within a multidisciplinary and interdisciplinary framework with due consideration of ethical and social aspects related to the application of their knowledge and skills;

9. have the skills to apply and integrate relevant concepts and methodologies in the area of hydraulic, hydrological and geotechnical engineering and research as well as applying computational principles within the context of hydraulic engineering;

10. have acquired sufficient skills in using information and communication technology for conducting studies and analyses, in addition to presentation and communication;

11. have adopted the academic attitude and learning skills to enhance and broaden the acquired knowledge and applications in an independent manner.

Hydraulic Engineering-Coastal Engineering and Port Development

After successful completion of the programme graduates will be able to:

1. have advanced level of understanding of the hydraulics, coastal processes and nautical and logistic aspects and their interactions with the nearshore and offshore structure;

2. apply sophisticated design techniques using theoretical concepts of coastal hydraulics and various principles and approaches of coastal engineering design to advance the needs of society for shelter, infrastructure and a safe environment and be able to evaluate and implement the solutions in a multidisciplinary and interdisciplinary environment;

3. develop strategies to cope effectively with problems related to natural hazards (e.g. coastal floods) and shoreline erosion problems and understand the conflict between coastal developments and natural coastal processes;

4. apply hydraulic and nautical, logistic and economic theories in the planning and design of coastal and ports layout and port logistics;

5. develop an understanding of the application of modern analysis and design techniques to coastal problems and gain the expertise necessary to make effective engineering interventions in the coastal environment;

6. be equipped with various analytical and computational expertise necessary to solve problems in coastal and port engineering;

7. have the skills to undertake academic research that contributes to the better understanding of coastal and/or port engineering;

8. have developed the skills to undertake independent creative academic activities and research and the ability to extend them leading to new knowledge that addresses problems of national and international importance;

9. place a coastal engineering and/or port project in its environment (social, ecological and physical environment), be able to quantify and understand the interactions between the project and the environment, and is able to communicate the interactions with experts of a different background;

10. have developed the talents and skills for problem formulation and solutions synthesizing different fields of knowledge to formulate solutions to relevant technical problems using modern engineering tools;

11. have experienced different aspects of learning which are integrated through different teaching methods and through independent study experiences;

12. possess critical thinking skills, the ability of both independent and team problem-solving and the sense of engineering creativity and design;

13. have acquired sufficient skills in using information and communication technology for conducting research, studies and analyses, in addition to presentation and communication;

14. develop a sense of professionalism and an appreciation for the obligations of a professional engineer;

15. be aware of the professional and ethical issues encountered in engineering practice.

Hydroinformatics– Modelling and Information Systems for Water Management

After successful completion of the programme graduates will be able to:

1. have in-depth understanding of the information cycle in relation to the management of water based systems, and have a thorough awareness of the flow of information from data acquisition to modelling, to support for decision making;

2. have a critical understanding of the theories and concepts of physical, chemical and biological processes relating to the flow of water in the natural environment, including river basins, coastal waters and urban water systems, as necessary to generate safe and reliable models for water based systems;

3. master the theory and practice of different modelling paradigms, and, in particular, physically based and data driven modelling, and be able to integrate them in hydroinformatics systems applied to a wide variety of hydraulic, hydrological and environmental situations;

4. have an understanding of advanced and appropriate information and communication technologies and their application to manage information relating to water management;

5. to select and apply software tools available on the market, and critically assess their advantages and disadvantages in application to water resources management, hazard risk assessment and forecasting, environmental planning and asset management;

6. have a good knowledge of the relevant literature and the contemporary research questions in the field of Hydroinformatics;

7. make critical use of advanced theories and concepts in Hydroinformatics to research creative solutions for new problems and situations, either independently or within a team;

8. critically judge and evaluate their own work and results, as well as prior research or investigations carried out by others;

9. provide considered advice to managers and users of advanced Hydroinformatics tools;

10. appreciate and discuss the ethics and nature of the postmodern society and the role of water within it as a "right" and an "asset";

11. develop a range of personal and communication skills, including the use of appropriate information and communication technologies, for oral and written presentation of methodologies, results, evaluations, conclusions and recommendations to a wide variety of audiences;

12. be aware of the importance of the relationship of Hydroinformatics with related disciplines such as hydraulics, hydrology, ecology and information science, and be able to co-operate within a multidisciplinary and interdisciplinary framework;

13. have adopted the academic attitude and learning skills to enhance and broaden the acquired knowledge and application skills in a largely independent manner;

14. be aware of the professional and ethical issues encountered in Hydroinformatics practice directed towards issues facing developing countries and countries in transition.

Hydrology and Water Resources

After successful completion of the programme graduates will be able to:

1. have in-depth understanding of the current theories and concepts in both surface and subsurface hydrology, the relevant physical, chemical and biological process interactions between the hydrosphere, the lithosphere, the biosphere and the atmosphere, and have a thorough awareness of the natural and human-induced variability in space and time of hydrological systems;

2. apply and integrate the relevant physical, chemical, applied mathematical, computational and earth-scientific principles and concepts, and to use information and communication technology within a hydrological context;

3. master the major hydrological methodologies and applications with regard to both water quantity and water quality, including techniques for data collection, processing and analysis, and the application of catchment hydrological modelling and aquifer modelling techniques;

4. evaluate and analyse hydrological systems and processes at a wide range of scales in both space and time for the purpose of water resources assessment, natural hazards assessment and mitigation, and environmental planning and management;

5. have a good knowledge of the relevant literature and the contemporary research questions in the field of hydrology;

6. design and conduct hydrological research and experiments for both application and scientific purposes, either independently or within a team-based framework;

7. critically judge and evaluate their own work and results, as well as prior research or investigations carried out by others;

8. adequately communicate methodologies, results, evaluations, conclusions and recommendations in oral, written and graphical form to a wide variety of audience;

9. be aware of the importance of hydrology to society, the relationship of hydrology with related disciplines such as ecology, meteorology and climatology, and be able to co-operate within a multidisciplinary and interdisciplinary framework with due consideration of ethical and social aspects related to the application of their knowledge and skills; and

10. have adopted the academic attitude and learning skills to enhance and broaden the acquired knowledge and application skills in a largely independent manner.

Hydraulic Engineering - Land and Water Development

After successful completion of the programme graduates will be able to:

1. have in-depth understanding and specific knowledge of:
    a. the latest concepts and theories of irrigation, drainage, flood protection, land reclamation and consolidation technologies for sustainable development;
    b. the cross-sectoral linkages comprehending wider aspects of society, economy and the environment;

2. use latest hydraulic engineering and hydrological methods to apply in planning, design and implementation of irrigation, drainage and flood protection schemes, independently or in a multidisciplinary team;

3. identify and cross-evaluate alternative land and water development options for areas under different land uses and assess their technical, economic, institutional and environmental feasibility;

4. engage in or advise developers, system managers and water users on the participatory development and management, as well as modernisation of irrigation, drainage and flood protection schemes for their planning, design, implementation, operation and maintenance, financing and performance assessment;

5. acquire knowledge and understanding of contemporary research issues in the field of land and water development;

6. formulate research questions, articulate research methodologies, develop study plans, and adequately communicate research results and conclusions in written and oral forms to a wide variety of audience.

Learning objectives Integrated Lowland Development and Management Planning (joint specialisation with Sriwijaija University)

After successful completion of the programme graduates will be able to:

1. have in-depth understanding and specific knowledge of:
    a. the current concepts and theories of irrigation, drainage, and land reclamation and land consolidation technology to support a sustainable development of lowlands with different types of land use;
    b. the multi-disciplinary involvement in the water sector linkages with the wider aspects of society, economy and the environment;

2. master the major hydraulic and environmental engineering aspects and hydrological methodologies, as well as applications for irrigation, drainage and flood protection schemes, including techniques for data collection, processing and analysis, and modelling techniques;

3. contribute to the planning, design, development and implementation (action plan for the realisation) of the hydraulic infrastructure for lowland development and management schemes;

4. advise developers, system managers and water users on the operation and maintenance aspects, as well as on modernisation of the water management and flood protection schemes;

5. have knowledge of contemporary research questions and the relevant literature in the field of integrated lowland development;

6. formulate and conduct hydraulic and environmental engineering research, plan development and designs in the field of integrated lowland development, experiments and tests for both practical and scientific purposes, either independently or within a team-based framework;

7. critically judge and evaluate their own work and results, as well as the information of prior research or investigations, plans and design;

8. adequately communicate methodology, research results, plans, designs, evaluations, conclusions and recommendations in written, oral and graphical form to a wide variety of audience;

9. formulate and evaluate a concept with its alternatives for integrated lowland development for areas with different type of land use and assess the technical and economic feasibility, as well as the environmental sustainability of the proposed integrated lowland development and/or management plans;

10. have adopted the academic attitude and learning skills to enhance and broaden the acquired knowledge and application skills in a largely independent manner.

Learning objectives Agricultural Water Management for Enhanced Land and Water Productivity (joint specialisation with AIT)

After successful completion of the programme graduates will be able to:

1. have in-depth understanding and specific knowledge of:
   - the latest concepts and theories of irrigation, drainage, flood management, land reclamation and consolidation technologies for increased returns from land and water resources in a sustainable manner;
   - the cross-sectoral linkages between land and water development and wider aspects of society, economy and the environment;

2. use latest hydraulic engineering and hydrological methods to apply in planning, design, implementation and management of irrigation, drainage and flood protection schemes, independently or in a multidisciplinary team;

3. identify and cross-evaluate alternative land and water development options for areas under different land uses and assess their technical, economical, institutional and environmental feasibility;

4. engage in or advise the developers, system managers and water users on the participatory development, management and modernisation, including planning, design, implementation, operation and maintenance, as well as on modernisation of the irrigation, drainage and flood management schemes;

5. acquire knowledge and understanding of contemporary research issues in the fields of land and water development and agricultural water management;

6. formulate and conduct hydraulic and agronomic research, plan development and designs in the field of enhanced land and water productivity, experiments and tests for both practical and scientific purposes, either independently or within a team-based framework;

7. formulate research questions, articulate research methodologies, develop study plans, and adequately communicate research results and conclusions in written and oral forms to a wide variety of audience;

8. develop the academic attitude and learning skills to enhance and broaden the acquired knowledge and application skills in a largely independent manner.

Learning objectives Agricultural Water Management for Arid and Semi-arid Climates (joint specialisation with Haramaya) University)

After successful completion of the programme graduates will be able to:

1. Have in-depth understanding and specific knowledge of:
   - the current concepts and theories of irrigation, drainage, and land reclamation and land consolidation technology to support a sustainable development of identified lands with different types of land use;
   - the multi-disciplinary involvement in the water sector linkages with the wider aspects of society, economy and the environment;

2. Master the major hydraulic and environmental engineering aspects and hydrological methodologies, as well as applications for irrigation, drainage and flood management schemes, including techniques for data collection, processing and analysis, and modelling techniques;

3. Be able to contribute to the planning, design, development and implementation (action plan for the realisation) of the hydraulic infrastructure for land development and management schemes;

4. Be able to advise developers, system managers and water users on the operation and maintenance aspects of the water management schemes;

5. Have knowledge of contemporary research questions and the relevant literature in the field of integrated land development;

6. Be able to formulate and conduct hydraulic, agronomic and institutional research, plan development and designs in the field of agricultural water management for arid and semi-arid climates, experiments and tests for both practical and scientific purposes, either independently or within a team-based framework;

7. Be able to critically judge and evaluate their own work and results, as well as the information of prior research or investigations, plans and design.

8. Be able to adequately communicate methodology, research results, plans, designs, evaluations, conclusions and recommendations in written, oral and graphical form to a wide variety of audience;

9. Be able to formulate and evaluate a concept with its alternatives for integrated land development for areas with different type of land use and assess the technical and economic feasibility, as well as the environmental sustainability of the proposed integrated land development and/or management plans;

10. Have adopted the academic attitude and learning skills to enhance and broaden the acquired knowledge and application skills in a largely independent manner.

Ecohydrology

After successful completion of the programme graduates will be able to:

1. demonstrate knowledge and understanding of the ecological and hydrological processes on varying spatiotemporal scales in the environment, of the socio-economic concepts underlying the functioning and exploitation of environmental systems, and of the complex inter-relationship between the protection and wise use of environmental resources;

2. design, optimise and interpret environmental monitoring and assessment schemes (including statistics and modelling) in order to gain an understanding of problems, trends, causes and effects;

3. critically analyse and evaluate a range of options and alternatives for the prevention or remediation of environmental problems, under different socio-economic, cultural contexts, and under often data-poor conditions;

4. contribute as a flexible and creative member in interdisciplinary teams in developing solutions for prevention or remediation of ecohydrological systems, by linking scientific knowledge to engineering interventions and to management decisions in different cultural and socio-economic contexts, and using different levels of available knowledge and information;

5. conduct research, independently or in a multidisciplinary team, including the formulation of research questions and hypotheses, the selection and application of research methodologies and techniques and the formulation of well-founded conclusions and recommendations;

6. communicate, debate and defend, clearly and systematically, findings and generated insights, and provide rational underpinning of these in oral and written presentations to a variety of audiences;

7. demonstrate academic attitude and learning skills (including thinking in multidisciplinary dimensions and distinguishing main issues from minor ones), to enhance and keep up-to-date the acquired knowledge and application skills in a largely independent manner.

Appendix B Eligible Bachelor's Degrees for Academic admission

SPECIALISATION	ACCEPTS APPLICANTS WITH A BSC DEGREE IN
MWI programme:	
Sanitary Engineering	civil, environmental or chemical engineering, or in microbiology
Water Supply Engineering	civil, chemical, environmental, hydraulic or mechanical engineering
Urban Water Engineering and Management	civil engineering
WSE programme:	
Hydrology and Water Resources	civil or agricultural engineering, earth sciences, environmental sciences, or physics.
Hydroinformatics	civil, agricultural or systems engineering, earth sciences, environmental sciences or physics.
Hydraulic Engineering and River Basin Development	civil engineering or related field with a hydraulic engineering background.
Hydraulic Engineering - Coastal Engineering and Port Development	civil engineering or related field with a hydraulic engineering background.
Hydraulic Engineering - Land and Water Development	civil or agricultural engineering, or a related field.
WM programme:	
Water Resources Management	engineering (civil, chemical, agricultural, irrigation or environmental), natural sciences, environmental science, agronomy, geography
Water Quality Management	engineering (civil, chemical, agricultural, irrigation or environmental), natural sciences, environmental science, chemistry, biology, ecology, agronomy, geography
Water Services Management	engineering (civil, chemical, agricultural, irrigation or environmental), natural sciences, geography, sociology, economics , law, political science, public administration, anthropology
Water Conflict Management	engineering (civil, chemical, agricultural, irrigation or environmental), natural sciences, environmental science, geography, sociology, economics , law, political science, public administration, anthropology
ES programme:	
Environmental Science and Technology	civil, chemical, agricultural or environmental engineering, natural sciences, chemistry, environmental science, agriculture, or in geology
Environmental Planning and Management	civil, chemical, agricultural or environmental engineering, natural sciences, chemistry, environmental science, agriculture, geology, geography, or in environmental economics
Water Quality Management	civil, chemical, agricultural or environmental engineering, natural sciences, chemistry, environmental science, agriculture, or in geology
Limnology and Wetland Ecosystems	civil, chemical, agricultural or environmental engineering, natural sciences, chemistry, environmental science, agriculture, or in geology

Appendix C Examination Procedures

General Rules

Students taking part in an examination are expected to have taken notice of these procedures and are expected to understand the implied meaning of these procedures.

Students are advised to arrive at an examination in time and to be outside the examination room 10 minutes before the examination is scheduled to start.

Misreading the date, time or room allocation will not be accepted as an excuse for absence from an examination or for arriving too late.

Written Examinations

Invigilators: The invigilators (examination supervisors) ensure proper conduct of the examination and maintain order in the examination room. They will announce the beginning and the duration of the examination, and will warn the students 10 minutes before the ending of the examination.

Communication: During the examination, students are not allowed to exchange materials or to communicate with other students. If something is unclear, students have to inform the invigilator, who will contact the programme coordinator, the examiner or planning officer if necessary.

Student card: Students are required to bring their UNESCO-IHE student card and are allowed to enter the examination room after a signal from the invigilators. Students will not be allowed into the room if they present themselves later than 15 minutes after the start of the examination.

Attendance list: After entering the examination room, students have to sign the attendance list. Students are considered to have taken part in an examination from the moment they receive the examination papers from the invigilators, whether or not they submit any answers.

Bags: Bags and carrying cases, including penholders, are to be placed along the side of the room before the start of the examination.

Exam paper: Each student has an allocated table with a set of answer and scratch papers with their student number printed on the cover sheet. Additional paper can be obtained from the invigilators upon request.
Students provide the answers in clearly readable English, with proper indication of the question label. All answer papers must carry the student number and locker number of the student. Unreadable answers or unidentified answer papers may be discarded for assessment by the examiner.

Pen: Students are required to bring the necessary writing and drawing tools. The answer papers to be submitted must be written with a pen, a pencil is not allowed.

Dictionary: The use of a printed language dictionary without any additional written annotations is allowed (all languages are allowed). Invigilators are allowed to check the dictionaries for hand-written annotations during the exam (spot checks while they are walking around).

Calculators: Only self contained calculators with a single-line display or dual-line display are allowed, provided that these devices are battery operated, that any audio functions are switched off, and that these devices are exclusively built for calculation purposes only and do not have internet access.

Cell phones: Use of cell phones is not allowed and must be switched off

Other materials: The use of materials other than listed above, including blank paper, texts, laptops, computing and communication devices, personal audio and video devices, of any kind, is not allowed.
Examiners may nevertheless allow students to use specified text matter or other effects in a so-called 'open book' examination. These materials shall not include previous or example examinations and solutions.

Toilet visit: Only one student at a time will be allowed by the invigilator to leave the examination room for a short visit to the lavatory, except during the first 15 and the last 15 minutes of the examination. Examination materials and requirements may not be taken outside the examination room.

Submission of exam papers: Students who finish the examination at least 15 minutes after the start and at least 15 minutes before the ending of the examination are allowed to submit their work to the invigilator and quietly leave the examination room.
Students have to ensure that all required papers are submitted to the invigilator. Papers cannot be submitted after the student has left the examination room.

ASSIGNMENT REPORTS AND INDIVIDUAL DISCUSSIONS

For designated subjects students have to submit an assignment report, which will be assessed as part of the subject examination. The examiner may discuss the assignment report with the student as part of the assessment.

The examiner will set a deadline for submitting assignment reports. The deadline cannot be set at a date after the examination period for the subject, as indicated in the academic calendar. Students submit assignments to either the lecturer or the responsible coordinator.

THESIS PROPOSAL AND RESEARCH EXAMINATIONS

The thesis proposal is to be submitted for assessment to the responsible professor and the mentor, who will evaluate the proposal and assign a 'satisfactory' judgement if the evaluation is passed. Additionally, a presentation by the student may be part of the evaluation.

The examination of the thesis research consists of a maximum 30 minutes presentation of the thesis work by the candidate, followed by a maximum 30 minutes examination discussion with the examination committee and, possibly, the audience.

Appendix D GRADING SYSTEMS used by partner institutes

JOINT SPECIALISATION IN:

- **SANITARY ENGINEERING**
- **WATER SUPPLY ENGINEERING**
-

Kwame Nkrumah University of Science & Technology (KNUST)

Grading scale of 0 to 100%, where 50% or higher implies a pass.
The minimum grade needed to have a postgraduate degree conferred upon an individual is a CWA of 55%.
CWA (Cumulative Weighted Average) = sum [credits x mark] / sum of all credits

Example:

Module	**Credit**	**Mark obtained**	**Total Module mark**
A	3	60	180
B	2	70	140
C	1	65	65
Total Credit of Student A	**6**		
Cumulative Mark			**385**

CWA= Cumulative Mark/Total Credit = 385/6 = **64.17**

JOINT SPECIALISATION IN:

- **UWEM**
- **AWELWP**
- **ETSuD**

Asian Institute of Technology

Grade	Grade Points	Description
A	4	Excellent
B+	3.5	
B	3	Good
C+	2.5	
C	2	Fair
D	1	Deficient
F	0	Fail
I		Incomplete

The grade needed to have a postgraduate degree conferred upon an individual is

- achieve a final cumulative grade point average of not less than 2.75;
- achieve a grade of excellent, very good, good or fair for the thesis, research study, project or internship

JOINT SPECIALISATION IN:

- **SANITARY ENGINEERING**
- **ENVIRONMENTAL SCIENCE**
- **HYDROINFORMATICS**

Universidad del Valle

0.0	Given when absent from the exam without valid reason, when blank exam is submitted, or when caught cheating.
1.0 - 2.9	Non-pass, resit needed
3.0	Acceptable
4.0	Good
5.0	Excellent

Degree is awarded when GPA is 3.5 or higher, and a pass is obtained for the thesis.

JOINT SPECIALISATION IN:

- **ILDMP**

Sriwijaija University

Same system as used at UNESCO-IHE

JOINT SPECIALISATION IN:

- **LWM**

Egerton University

70% and above	A (Excellent)
60-69%	B (Good)
50-59%	C (Average)…
0-49%	F (Fail)

Grading systems approved by the University Senate, with 50% as the pass mark.

BOKU

is using the Austrian grading system, which is a five step grading system ranging from (1,very good to 5, not sufficient). Grade 1 to 4 indicate a successful result.
The following grading scale is used:

Austrian grade	ECTS grade	Verbal
1 (sehr gut)	A/B	excellent/very good
2 (gut)	C	good
3 (befriedigend)	D	satisfactory
4 (genügend)	E	pass
5 (nicht genügend)	F/FX	fail

ERASMUS MUNDUS PROGRAMME: 'IMETE'

Gent, Prague

ECTS			Gent University		UNESCO-IHE*			ICTP
A++ (exceptional only 1%)			19 or 20		10			100
A (top 5%)			18		9.2			90-100 A
A (top 10%)			17		8.8			
B (top 20%)			16		8.4			80-89 B
B (top 35%)			15		8			
C (top 50%)			14		7.6			70-79 C
C (top 65%)			13		7.2			
D (top 80%)			12		6.8			60-69 D
E (top 90%)			11		6.4			50-59 E
E (just pass)			10		6			
F (fail)			9		5.4			0-49 F
			8		4.8			
			7		4.2			
			6		3.6			
			5		3			
			4		2.4			
			3		1.8			
			2		1.2			
			1		0.6			
			0		0			

* UNESCO-IHE marks in the table were calculated from interpolation, with a score of 10 at Gent University equal to a 6.0 at UNESCO-IHE, a 20 at Gent University equal to a 10 at UNESCO-IHE and a 0 at Gent University equal to a 0 at UNESCO-IHE.

ERASMUS MUNDUS PROGRAMME: 'FLOOD RISK MANAGEMENT'

TU Dresden:
A = 1 “very good”
B = 2 “good”
C = 3 “satisfactory”
D = 4 “sufficient”
E = 5 " insufficient"

All courses have to be lower than 4 for a degree.

University of Ljubljana
10-(excellent: outstanding results with negligible mistakes),
9-(very good: high pass with minor mistakes),
8-(very good: sound knowledge),
7-(good: sound knowledge with major mistakes),
6-(satisfactory: adequate knowledge suiting minimum criteria),
5 - 1-(insufficient: failure, poor knowledge below minimum criteria).
Candidates with grades satisfactory (6) or more, have passed the examinations successfully.
The student has two grades per subject: separately theory and lab exercise (seminar work).
For thesis there are also two grade: written report and presentation, both should be more than 6. Finally we have one grade for thesis and common final grade of study (special formula).

TU-Catalonia
Scale from 0-10
MH Honors (is igiven on exceptional cases)

9.0 - 10.0	excellent
7.0 - 8.9	very good
5.0 - 6.9	satisfactory
4.0 - 4.9	marginal fail
0.0 - 3.9	fail
NP	not examined
R	recognition

ERASMUS MUNDUS PROGRAMME: 'ECOHYDROLOGY'

University of Algarve
University of Lodz
University of Kiel
University of La Plata

Grades issued by the partners are converted according the following table:

Numerical National Marks				
CAU	ULodz	IHE	UALG	ULP
1	5	9.0 – 10	20	10
1.3	4.7 – 4.9	8.6 – 8.9	19 →	9.3 – 9.9
1.7	4.4 . 4.6	8.3 - 8.5	18 → 18.9	8.5 – 9.2
2	4.1 – 4.3	8.0 - 8.2	17 → 17.9	8.0 – 8.4
2.3	3.9 – 4.2	7.7 – 7.9	16 → 16.9	7.4 – 7.9
2.7	3.5 – 3.8	7.3 - 7.6	14 → 15.9	6.5. 7.3
3	3.3- 3.4	7.0 - 7.2	12 → 13.9	6.0 – 6.4

3.3	3.1.- 3.2	6.7 - 6.9	11 → 11.9	5.4 – 5.9
3.7	2.7 – 3.0	6.3 - 6.6	10.5 → 10.9	4.5 - 5.3
4.0	2.5 – 2.6	6. 0 - 6.2	10 → 10.4	4 - 4.4
← 4.0	← 2.5	← 6.0	← 10.0	← 4.0

JOINT SPECIALISATION IN:

- **AWMASC**

University of Haramaya

Grade	Description	Grade Point	Conversion to marking on scale of 10
A	Excellent	4.00	9.1 to 10
B+	Very good	3.50	8.5 to 9.0
B	Good	3.00	7.5 to 8.5
C+	Fair	2.50	6.0 to 7.5
C	Unsatisfactory	2.00	5.0 to 6.0
F	Failure 0		< 5.00

A graduate student who scores an "F" or "C" grade may repeat the course only once.

Grades obtained on repeated courses shall be final. Previous grade or grades of "F" or "C" should be shown as canceled on the transcript to indicate that the course has been repeated; and the new grade, shall be included in the computation of the final marks,

Graduate students repeating courses in which they scored "F" and/or "C" grades must register for the courses and carry out all academic activities pertaining to the courses.

Appendix E MSc module assessment methods

Urban Water and Sanitation programme

	Written exam (%)	Oral exam (%)	Assignments (%)	Oral presentation (%)	Lab Report (%)	Home work (%)
MWI01	60		15+25			
MWI02	30+45		25			
MWI03	70		30			
MWI/WSE/04	60		20		20	
MWI/SE/UWEM/04	60		20		20	
MWI/SE/05	100		60			
MWI/UWEM/05		60	40			
MWI/WSE/05	80				20	
MWI/SE/06	80		20			
MWI/WSE/06	70		15		15	
WSM/06			100			
MWI/SE/07						
MWI/WSE/UWEM/07	60		40			
MWI/SE/08	60		25+15			
MWI/WSE/08	70		20		10	
WSE/HI/08B/e	40		60			
MWI/09			100			
MWI/SE/UWEM/10	60		25			15
WSE/HI/10B/e	40		30+30			
MWI/WSE/10	**60**		40			
MWI/SE/11	100		80	20		
MWI/WSE/11a	60		10+10+10+10			
MWI/WSE/11/b	60		30	10		
MWI/12			50+30	20		
MWI/13	60		40			
MWI/14		100				
MWI/15		100				

The programme components, credits, and the nature of the examinations in the specialisation Water Supply Engineering and Sanitary Engineering with **KNUST** are:

Name	ECTS	Examination	Assignments Role play Exercises
Module (KN) 1 Introduction to Environmental Sanitation	5	70	30
Module (KN) 2 Mathematical and research methods	4	70	30
Module (KN) 3 Environmental science and process technology	6	70	30
Module (KN) 4 Environmental quality	3	70	30
Module (KN) 5 water supply	2	70	30

The programme components, credits, and the nature of the examinations in the specialisation Sanitary and Environmental Engineering with **Univalle** are:

Name	ECTS	Examination (%)	Workshops, Lab reports, assignments (%)
C1 Chemistry of Environmental Pollution	5.13	50	20%: Workshops 30%: Lab reports
C2 Environmental Pollution Microbiology	5.13		presentation of related articles followed by open questions; written assignment; written exam; lab reports
C3 Fundamentals of Environmental Processes	5.13	60	20%: Home work and workshops 20%: Case study
C4 Environmental and Development	5.13	35	30%: Three workshops or short assignments 35%: Final assignment with presentation
C5 Engineering Research Introduction	3.42		100% Report

Environmental Science programme

	Written exam (%)	Oral exam (%)	Assignments (%)	Oral presentation (%)	Lab Report (%)	Home work (%)	Integrated in modules (%)
ES/01	75		25				
ES/02	60		25 +15				
ES/03	75		25				
ES/04	60		40				
ES/05/bL	60		10	20	10		
ES/05/TM	40		40	20			
ES/05/W	70		20		10		
ES/06/L	60			20	20		
ES/06/M	70		20			10	
ES/06/T	50		25 +25				
ES/06/W	60		40				
ES/07/L	60		10	20			10
ES/07/MW	70		30				
ES/07/T	70		20		10		
ES/08/L	60			20			10+10
ES/08/MW	100						
ES/08/T	60		35	5			
ES/09/L	40		40	20			
ES/09/TMW							100
ES/10/L	**60**			30	10		
ES/10/TWL			80+10	10			
WSM/06			100				
ES/11/L	40		40	20			
ES/11/MW	70		30				
ES/11/T	60		35	5			
ES/11/X	70		30				
ES/12/L	60		10	30			
ES/12/TMW			100				
ES/13			100				
ES/14			100				
ES/15			100				

The programme components, credits, and the nature of the examinations in the specialisation ***Environmental Science and Technology*** with Univalle are:

Name	ECTS	Examination (%)	Workshops, Lab reports, assignments (%)
C1 Chemistry of Environmental Pollution	5.13	50	20%: Workshops 30%: Lab reports
C2 Environmental Pollution Microbiology	5.13		presentation of related articles followed by open questions; written assignment; written exam; lab reports
C3 Fundamentals of Environmental Processes	5.13	60	20%: Home work and workshops 20%: Case study
C4 Environmental and Development	5.13	35	30%: Three workshops or short assignments 35%: Final assignment with presentation
C5 Engineering Research Introduction	3.42		100% Report

Water Science and Engineering programme

	Written exam (%)	Oral exam (%)	Assignments (%)	Oral presentation (%)	Lab Report (%)	Home work (%)	Integrated in modules (%)
WSE/01/c	20 (x3)		20 (x2)				
WSE/02/c	35 (x2)		30				
WSE/CEPD/03/s	10	50+30+10					
WSE/LWD/03/s		15	70 + 15				
WSE/RBD/03/s	25+25+25		25				
WSE/HI/03/s	40		15+15+30				
WSE/HWR/03/s	25+25+20		10+10+10				
WSE/CEPD/04s	60	20	20				
WSE/LWD/04/s	30		20+25+25				
WSE/RBD/04/s	80		20				
WSE/HI/04/s	35+20		15+30				
WSE/HWR/04/s	70		30				
WSE/CEPD/05/s			30+70				
WSE/LWD/05s	35		10+30+25				
WSE/RBD/05s	40+20		20+20				
WSE/HI/05s	15	35	30+20				
WSE/HWR/05/s	50+30+20						
WSE/CEPD/06/s	100						
WSE/LWD/06/s			25+20+30+25				
WSE/RBD/06/s	25+15		25+10+25				
WSE/HI/06/s	25+30		10+15+20				
WSE/HWR/06/s	50+50						
WSE/CEPD/07/s	15+15+15+15		40				
WSE/LWD/07/s		70	30				
WSE/RBD/07/s		100					
WSE/HI/07/s	100						
WSE/HWR/07A/s	60				40		
WSE/HWR/07B/s	25+35+15		10+15				
WSE/CEPD/08A/e				100			
WSE/CEPD/08B/e				100			
WSE/LWD/08/e			30+15+30+25				
WSE/RBD/08A/e	80		20				
WSE/HI/08A/e	65		35				
WSE/HI/08B/e	40		60				
WSE/HWR/08/e			50+35	15			
WSE/09/c						100	
WSE/CEPD/10/e		70	30				
WSE/LWD/10/e			45+30+25				
WSE/RBD/10/e	45+45		10				
WSE/HI/10A/e	60		40				
WSE/HI/10B/e	40		30+30				
WSE/HWR/10B/e			70+30				
WSE/11							
WSE/CEPD/11/e	20	40	40				
WSE/LWD/11/e			40+60				
WSE/RBD/11/e	30+30		40				
WSE/HI/11/e			40+30+30				
ES11MW	70		30				
WSE/12/c				100			
WSE/13/C			100				
WSE/14/c			100				
WSE/15			100				

The programme components, credits, and the nature of the examinations in the specialisation ***Land and Water Development with Haramaya University*** are:

Name	ECTS	Examination	Assignments
Course work Semester I			
1. Soil Plant Water Relations	2	Final examination – 70%.	Laboratory Reports - 30%
2. Applied Hydrology	3	Written Exam (2): 40%	Assignments: 20% Project: 40%
3. Design of Surface Irrigation Systems	3		
4. Experimental Design and Analysis	2	Final examination – 60%.	Assignments including softwares outputs – 20% Presentation (20%)
Course work Semester II:			
1. Pressurized Irrigation Systems Design	3		
2. Watershed Management	3	Mid examination – 20%; Final examination – 40%	Assignments - 40%;
3. Dams and Hydraulic Structures	3	Mid examination – 30% Final examination – 50%.	Assignments – 20%
4. Drainage and Salinity Control	3	Final examination – 60%.	Two Design Projects - 40%

The programme components, credits, and the nature of the examinations in the specialisation ***Land and Water Development with Asian Institute of Technology*** are:

Name	ECTS	Examination	Assignments
Watershed Hydrology	7.5	Mid-semester Exam (30%), Final Exam (40%) and	Assignment/Semester Paper (30%).
Hydrodynamics	7.5	Mid-semester Exam (40%), Final Exam (50%) and	Assignment (10%).
Irrigation and Drainage Engineering	7.5	Mid-Semester Exam (30%); Final Exam (40%);	Exercises/Reports (30%)
Integrated Water Resources Management	7.5	Mid-semester Exam (20%), and Final Exam (30%)	Assignment and Project Work (50%)

The programme components, credits, and the nature of the examinations in the specialisation ***Land and Water Development with Sriwijajija University*** are:

Name	ECTS	Examination	Assignments
Semester 1			
1. Environmental Science	2	Exams/ 40%	Quiz/ 15% Assignment/ 25% Oral disc. presentation / 20%
2. Resource Economics	2	Mid Exam/ 20% Final Exam/ 30%	Exerc./ 20% Quiz/ 15% Assigments/ Presentation/ 15%
3. Environmental Law	2	Exams/ 30%	Assignments/ 25% Quiz/ 20% Oral/ 25%
4. Eco-statistic	3	Exam 1/30% Exam 2/30%	Assignments/20% Quiz 1/10%

			Quiz 2/10%
5. Environmental Sociology	2	Exams/ 25%	Assignment/ 20% Oral disc/ 25% Quiz/ 20% Presentation/ 10%
6. Environmental Value and Ethics	2	Exams/ 40%	Quiz / 15% Assignments/ 25% Oral disc./ presentation 20%
7. Research methods	2	Exams/ 30%	assignment/30% Quiz / 20% Oral disc and presentation./20%
Semester 2			
1. Environmental Management System	2	Exams/ 30%	assignment/30% Quiz / 20% Oral disc and presentation./20%
2. Integrated Aspects of Lowland Management	3	Exams/ 30%	Assignment/30% Quiz / 20% Oral disc and presentation./20%
3. Managing, Organization and Change in Lowland Schemes.	3	Exams/ 30%	assignment/30% Quiz / 20% Oral disc and presentation./20%
4. Soil and Water Data Collection, Monitoring Evaluation	2	Exams/ 20%	Lab, Assignment/40% Quiz / 20% Oral disc and presentation./20%
5. Lowland Hydrology	2	Written test/ 30%	Assignments/ 20% Assignments, oral disc./ 25% Lab, Field works/ 25%

The programme components, credits, and the nature of the examinations in the specialisation ***Flood Risk Management*** are:

			Credits	Exams
Sem1	September – February (year 1)	Dresden		
	Flood Risk Management I	TUD	10	written exam (50%), the study work (30%) and the protocol of the study tour (20%).
	Flood Risk Management II	TUD		
	Meteorology and Hydrology	TUD	5	written exam
	GIS and Remote Sensing	TUD		
	Climate change	TUD	5	written exam (45 minutes), and an oral presentation
	Hydraulic Engineering	TUD	5	a written exam
	Hydromechanics	TUD		
	Ecology	TUD	5	25% oral presentation 75% written exam **or** the study work
	Statistics	TUD	5	written exam
	Geodesy	TUD		written exam, participation in at least 70% of the offered practicals
Sem 2	March – July (year 1)	Delft, Netherlands		

March	Computational Intelligence and Control Systems	IHE	5	Exercise report (10%) Written exam & exercises (45%) Written exam (25%) Exercise report (20%)
April	River Basin Modelling	IHE	5	Exercises reports on three topics (10%) (20%) (30%) participation & oral exam (40%)
end of April – end of May	*Option A*: • River flood modelling and 1D flood routing *Option B*: • Urban drainage systems and Urban flood modelling	IHE	5 5	Written exam 10% Exercise report (50%) Oral exam (40%) Written exam (10%) Exercise report (50%) Written exam (40%)
end of May – first half of June	International Fieldtrip (12 days)	IHE	5	Fieldtrip report
2nd half of June – beg. of July	Flood Risk Management III	IHE	5	Exercise reports (40%) Written exam on all subjects (60%)
July	**Hydroinformatics for Decision Support** **Watershed & River Basin Management**	IHE	5 5	Assignments (35%) Assignments (30%) Assignments (20%) Assignments (15%) Exercise reports (40%) Written exam on all subjects (60%)
August	Vacation			
Semester 3	September – January (year 2)	Barcelona, Ljubljana		
	Implications of global warming on floods and droughts	UPC	3	Exercises reports on three topics (10%) (30%) (20%) & oral exam (40%)
	Coastal flooding: impacts, conflicts and risks	UPC	7	Conventional exam and/or a case study
	Debris flow and flash floods: risk, vulnerability, hazard and resilience concepts	UPC	6	Exercises reports on five topics (55%) Participation fieldtrip (5%) & exam (40%)
	Applications of radar-based rainfall observations and forecasts in early warning systems and flood forecasting	UPC	3	Conventional exam and/or a case study
	Spatial planning for flood protection and resilience	UL	5	Written exam (20%) Written exam & exercises (40%) Written exam & exercises (40%)

	Socio-economic and institutional framework of floods	UL	5	Exercise report (10%) Written exam & exercises (45%) Written exam (25%) Exercise report (20%)
	Fieldtrips	UPC, UL		
Semester 4	February – July (year 2)	different locations		
	Masters thesis in one of the partner institutes or with the associated partners			
End of July	Joint seminar/workshop MSc defences Diploma awarding	all in one of the institutions		

The programme components, credits, and the nature of the examinations in the specialisation ***Ecohydrology*** are given in the programme handbook

Water Management programme

	Written exam (%)	Oral exam (%)	Assignments (%)	Oral presentation (%)	Lab Report (%)	Home work (%)	Integrated in modules (%)
WM/1	50		25+25				
WM/2	65		35				
WM/3	50		20+30				
WM/4	50		20	30			
WM/WCM/5	40		40				20
WM/WRM/5	65		35				
WM/WSM/5	70		30				
ES/5/W	70		20		10		
WM/WCM/6	40		40				40
WM/WRM/6	60			40			
WM/WSM/6			100				
ES/06/T	50		25+25				
ES/06/W	60		40				
WM/WRM/7	65		35				
WM/WSM/7	65		20+15				
ES/07/MW	70		30				
WM/8	60		40				
WM/9			30	30+30			
WM/WRM/10	50		15+15+20				
WM/WSM/10	70		30				
ES/10/TWL	80		10	10			
WM/WSM/11			20+30+50				
ES/11/MW	70		30				
ES/11/X	70			30			
WM/12			65+35				
WM/13A				100			
WM/13B			100				
WM/14		100					
WM/15		100					

Appendix F MSc thesis marking guidelines

Criterion 1	9.0 - 10.0	8.0 - 8.9	7.0 - 7.9	6.0 - 6.9	5.9 and below
	Excellent	Very Good	Good	Sufficient	Fail
Knowledge and understanding of the subject and answers to questions	An excellent and informative introduction , well-researched, with appropriate and key references. Evidence of critical thinking. Clear aims and objectives, within an overall context, which identifies knowledge gaps. Sets the scene for the research succinctly and elegantly.	Good project background, with reference to key literature. A logical framework that identifies the research objectives, but may lack some thoroughness, or comprise a limited series of research questions. It might be competent but a little mundane. .	Covers the main areas, but has minor flaws in logic or omissions of important detail, or minor flaws in structure. Aims and objectives comprehensible, but maybe slightly over or under ambitious, and/or lacking in clarity or precision. Objectives may be unrealisitc.	Generally lacks some coherence; may be poorly referenced, but includes at least some points relevant to the research. Aims and objectives no more than adequate.	Poorly structured, with significant omissions of key background literature. No logical progression. Fails to set the context of the project. Research question not developed into appropriate or testable hypotheses

Criterion 2		9.0 - 10.0	8.0 - 8.9	7.0 - 7.9	6.0 - 6.9	5.9 and below
		Excellent	Very Good	Good	Sufficient	Fail
Originality, analysis and interpretation	Methods	Well-chosen and entirely appropriate and often novel methods identified clearly. Clear and easy to follow procedures and techniques. Where appropriate, good site description, with informative maps, diagrams etc.	Appropriate actions and methods identified and detailed. Where appropriate, setting of research well described with relevant maps etc	Methodology generally sound but with some lapses in detail of methods, and/or proposed analysis. Maps or diagrams may be poorly produced, or not clear in the context of the research	Significant gaps in methods, or methods not always appropriate to the research questions, or very difficult to comprehend. Lapses in detail in parts of methodology. Maps may be absent or poorly produced.	Methodology vague and poorly detailed. No obvious understanding of methodology relevant to research theme. Maps etc may be poorly produced or absent.
	Results	These are well analysed and presented with clarity, with clear and comprehensive relationship to the the research questions.	Results reported well and with clarity . Some minor lapses in summary of findings. Shows ability to address methodological short-comings	Results comprehensible, generally linking with the research questions. Figures and tables convey adequate meaning, providing a summary of at least some of the key findings.	Some obvious flaws in analysis, but the general essence of the key findings conveyed.	Difficult to follow the results and, analysis. Presentation careless and poor summary of the key findings
	Discussion	Elegant and well structured, placing the results in the context of the international literature and demonstrating a clear understanding of their significance, and/or shortcomings. Show some new ideas and novel interpretation.	Identifies the key finding and relevance of these to some key literature. A well ordered sequence to the chapter to produce a logical framework.	Recognises some interesting findings, but may be limited in placing these into a wider context. At lease some use of key literature. There will likely to be some repetition with the results section.	Largely a repetition of the results section, with minimal context to wider understanding and relevant literature.	Fails to identify key findings and/or their wider significance . Little logical framework and lacking any individual ideas or intepretation.

Criterion 3	9.0 - 10.0	8.0 - 8.9	7.0 - 7.9	6.0 - 6.9	5.9 and below
	Excellent	Very Good	Good	Sufficient	Fail
Organisation, style, presentation and communication	Writing elegant and succinct. Uses precise language and correct terminology throughout. Figs and Tables well laid out to a publishable quality with accurate and succinct legends.	A clear and well-written report that is technically proficient.	A generally well-written report that is understandable. Uses appropriate terminology. Occasional spelling or grammatical errors. Presentation generally neat	Language generally clear and uses correct terminology, but with some misunderstandings and lapses in grammar or spelling. Presentation and use of tables and figures may be sloppy.	Sentences and/or paragraphs poorly constructed. Language inexact or ambiguous. Contains numerous grammatical and spelling mistakes.

Criterion 4	9.0 - 10.0	8.0 - 8.9	7.0 - 7.9	6.0 - 6.9	5.9 and below
	Excellent	**Very Good**	**Good**	**Sufficient**	**Fail**
Creativity, independence, work planning and critical attitude	Student self-motivated and independent. Engages in intelligent discussion and responds well to suggestions.	Significant help may be given, but students show ability to learn from suggestions and develop ideas and research approaches accordingly.	Needs clear guidance and support, but gradually develops the required competencies.	A need to repeat instructions a number of times. Generally finds taking initiative difficult, and limited self-reliance.	Lacks motivation, or much ability to develop competencies. Shows little self reliance or interest in the topic.

Environmental Science programme overview 2013-2015

		EST Environmental Science and Technology	EPM Environmental Planning and Management	WQM Water Quality Management	IMETE IMETE	ETSuD ETSuD	LWM Limnology and Wetland Management	EST-Univalle
1	……..-20/10 21/10-27/10	Week ONE introduction (ALL)				Programme at AIT, Bangkok	Programme at BOKU, Vienna	Programme at Univalle, Cali
1	28/10-03/11 04/11-10/11	Introduction to environmental science (ES0123)						
2	11/11-17/11 18/11-24/11 25/11-01/12							
..	02/12-08/12	Examination Week						
3	09/12-15/12 16/12-22/12	Introduction to environmental science (ES0123)						
..	23/12-29/12 30/12-05/01	Free Period				Travel to Delft (..)		Travel to Delft (..)
3	06/01-12/01	Introduction to environmental science						
4	13/01-19/01 20/01-26/01 27/01-02/02	Integrated project environmental science (ES04)						Integrated project environmental science (ES04)
..	03/02-09/02	Examination Week						Examination Week
5	10/02-16/02 17/02-23/02 24/02-02/03	Environmental systems analysis (ES05TM)	Environmental systems analysis (ES05TM)	Water quality assessment (ES05W)	Travel to Prague (..)	Environmental systems analysis (ES05TM)	Travel to Kenia (..)	Environmental systems analysis (ES05TM)
6	03/03-09/03 10/03-16/03 17/03-23/03	Environmental engineering (ES06T)	Water and environmental policy making (ES06M)	Wetlands for water quality (ES06W)	Programme in Prague (..)	Wetlands for water quality (ES06W)	Programme in Egerton Lake ecology (ES05bL) Stream and river ecology (ES06L)	Environmental engineering (ES06T)
..	24/03-30/03	Examination Week				Examination Week		Examination Week
7	31/03-06/04 07/04-13/04 14/04-20/04	Environmental monitoring and modelling (ES07T)	Environmental planning and implementation (ES07MW)	Environmental planning and implementation (ES07MW)		Environmental monitoring and modelling (ES07T)	Tropical wetlands for water quality (ES07L)	Environmental monitoring and modelling (ES07T)
8	21/04-27/04 28/04-04/05 05/05-11/05	Cleaner production and the water cycle (ES08T)	Water and environmental law (=> WM08)	Water and environmental law (=> WM08)		Cleaner production and the water cycle (ES08T)	Fisheries and aquaculture (ES08L)	Cleaner production and the water cycle (ES08T)
..	12/05-18/05	Examination Week				Examination Week	Travel to Delft (..)	Examination Week
9	19/05-25/05 26/05-01/06 02/06-08/06	Foreign fieldtrip and fieldwork ES (ES09TMW)				Foreign fieldtrip and fieldwork ES (ES09TMW)	Wetlands for Livelihoods and Conservation (ES09L)	Foreign fieldtrip and fieldwork ES (ES09TMW)
10	09/06-15/06 16/06-22/12 23/06-29/06	Aquatic ecosystems processes and applications (ES10TWL)	Institutional analysis (=> WRM10)	Aquatic ecosystems processes and applications (ES10TWL)		Aquatic ecosystems processes and applications (ES10TWL)	Aquatic ecosystems processes and applications (ES10TWL)	Aquatic ecosystems processes and applications (ES10TWL)
Click HERE TO CHOOSE YOUR MODULE 10+11 (2013-2015)								
11	30/06-06/07 07/07-13/07 14/07-20/07	Solid waste management (ES11T) or Watershed and river basin management (ES11MW) or IWRM as a tool for adaptation to climate change (ES11X) or Data analysis and modelling for aquatic ecosystems (ES11L) or a module form another programme(WSE MWI WM)			Summer schools	Solid waste management (ES11T) or Watershed and river basin management (ES11MW) or IWRM as a tool for adaptation to climate change (ES11X) or Data analysis and modelling for aquatic ecosystems (ES11L) or a module form another programme(WSE MWI WM)		
..	21/07-27/07	Examination Week				Examination Week		
..	28/07-03/08	Free				Free		
12	04/08-10/08 11/08-17/08 18/08-24/08	Groupwork ES (ES12TMW)				MSC proposal (ES14)	Groupwork ES (ES12TMW)	
..	25/08-31/08	Examination Week				Examination Week		
13	01/09-07/09 08/09-14/09 15/09-21/09	Week 1:Research methodologies and skills Week 2 and 3: SUMMER COURSES (ES13)			Travel to Ghent (..)		Week 1:Research methodologies and skills Week 2 and 3: SUMMER COURSES (ES13)	Travel to Cali (..)
14	22/09-28/09 29/09-05/10 06/10-12/10	MSc thesis proposal (ES14)			Programme in Ghent (..)	Travel to AIT (..)	MSc thesis proposal (ES14)	Programme in Cali (..)
..	13/10-19/10	Examination Week					Examination Week	
15	20/10/14 …. …… …… …… …. 12/04/15	MSc thesis period (6 months) (ES15)				MSc thesis AIT (..)	MSc thesis period (6 months) (ES15)	
..	13/04-19/04 20/04-26/04	Final Examination Week(s)					Final Examination Week(s)	

MASTERS PROGRAMME ES 2013-2015 - PART 2

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ENVIRONMENTAL SCIENCE

MASTERS PROGRAMME
Academic Year: **2013-2015**
Specialization: **Core Programme**
Module Coordinator: **Hes, E.M.A.**

Module Sheet

Module Name Week 1 + Introduction to environmental science	Module Code ES0123	Credits 15

Target Group	Prerequisites
Programme target group	Programme prerequisites

Learning Objectives

Upon completion of the module participants will be able to..

- Make a critical analysis of the global and national agendas and policies for "Water and Environment" in the context of sustainable development;
- Identify and describe the major global, regional and local environmental problems;
- Identify and describe the basic natural, chemical, hydrological and socio-economic processes in relation to the environment;
- Explain basic environmental concepts, such as ecological footprint, feedback mechanisms, ecosystem dynamics, carrying capacity and nutrient cycling.
- Apply basic principles of data analysis, statistics, environmental modelling and GIS
- Apply the principles of the scientific method to design, develop and communicate a research project

Topics and Learning Activities

Water, environment and sustainable development (week 1)

Week 1 will provide an introduction to the global agendas and policies for water and environment. Participants will be introduced to key documents in these fields (World Water Vision, Vision21, Earth Summit on Sustainable Development, WWF-3). The concept of IWRM will be explained and illustrated by examples.

Learning Activities:

Week 1 will consist of lectures, exercises, workshops, video-conferencing sessions, and role play sessions.

Hydrology and Chemistry (two separate topics)

In hydrology the main items will be precipitation and collection of meteorological data, evaporation, soil moisture, geo-hydrology and the hydrodynamics of ecosystems.

Environmental) chemistry will first discuss electrolytes in water, solubility and redox systems. Subsequently emphasis will be given to sources and fate of micro-pollutants in water and sediments.

Learning Activities:

Lectures (the lectures in chemistry are supported by laboratory sessions)

GIS, environmental modelling, data analysis and statistics

You will apply the basic principles with practical examples and case studies

Learning Activities:

Lectures and exercises

Case study environmental problem: eutrophication

Learning Activities:

The case study eutrophication consists of laboratory activities.

Microbiology and ecology two separate topics)

The basic aspects of natural processes in relation to the environment will be discussed. In microbiology the (micro-)biological actors in the cyclic processes of the most important elements (C, N, P, S) will be discussed. The lectures in microbiology are supported by laboratory sessions

In ecology basic ecological concepts will be discussed in relation to the structure and function of major ecosystems. Interactions between ecosystems and human activities will be analysed. Human beings always affect the environment.

Learning Activities:

Lectures and laboratory sessions (microbiology)
Lectures (ecology)

Economics with special focus on use and scarcity of natural resources

The subject of use and scarcity of natural resources starts with reviewing resource and scarcity concepts and mechanisms leading towards and away from scarcity. In a second part, the cases of specific resources are

treated: food, wood, fish, biodiversity, water and energy.

Learning Activities:
Lectures + simulation game

Academic and communication skills

This topic deals with critical thinking, academic writing, presentation skills, group dynamics.

Learning Activities:
Lectures, excercises

Lecturing Material

• Lecture notes, laboratory notes
Cunningham & Cunningham, Environmental Science, a global concern. 11th ed.

Assessment

- **70%: Written Exam (closed book) -- Assessment 1 (Hydrology and Chemistry)**
- **30%: Assignment -- Assessment 1 (GIS)**
- **60%: Written Exam (closed book) -- Assessment 2 (Data analysis, statistics and environmental modelling)**
- **40%: Assignment -- Assessment 2 (academic skills, communication skills, data analysis and statistics)**
- **80%: Written Exam (closed book) -- Assessment 3 (Microbiology, Ecology and Economics)**
- **20%: Assignment -- Assessment 3 (academic skills and communication skills)**

2013/2015-ES0123: Week 1 + Introduction to environmental science											
Nr	**Course/Topic**	**Lecture**	**Assignment**	**Workshop Case study Role play Exercise Lab session**	**Laboratory work**	**Fieldtrip - Fieldwork**	**Design exercise**	**SUM: contact hours**	**SUM: studyload hours**	**Lecturer(s)**
	Water, environment, sustainability		**15**	**20**				**20**	**35**	several
	GIS	**8**		**8**				**16**	**32**	van der Kwast
	Chemistry	**10**		**10**				**20**	**40**	Kelderman
	Hydrology	**10**						**10**	**30**	Wenninger
	Lab eutrophication			**10**				**10**	**10**	Irvine, Kelderman and de Ruyter
	Microbiology	**9**		**12**				**21**	**39**	van de Vossenberg and van Bruggen
	Economy, natural resources	**8**		**8**				**16**	**32**	Bijlsma
	Ecology	**10**						**10**	**30**	de Ruyter
	Data analysis and statistics	**12**		**14**				**26**	**50**	van Dam and ???
	Environmental Modelling	**12**		**12**				**24**	**48**	van Dam and Hes
	Academic skills	**8**		**8**				**16**	**32**	Irvine, Darvis and others
	Communication skills	**9**		**10**				**19**	**37**	Sturrock, Taylor and others
	Exams		**8**						**8**	
	Â									
	Total	**96**	**23**	**112**				**208**	**423**	
MSc module - UNESCO-IHE										

ENVIRONMENTAL SCIENCE

MASTERS PROGRAMME
Academic Year: 2013-2015
Specialization: Core Programme
Module Coordinator: Dam, A.A. van

Module Sheet

Module Name Integrated project environmental science	Module Code ES04	Credits 5

Target Group	Prerequisites
Programme target group	Programme prerequisites

Learning Objectives

Upon completion of the module participants will be able to..

- describe environmental quality and identify its main elements and parameters
- explain the concept of sustainable development and to discuss its main challenges.
- compare and contrast relevant scientific information from a variety of sources and present the findings in a concise report
- make an oral presentation of scientific information
- statistically analyze, evaluate and present scientific data

Topics and Learning Activities

Integrated project
Academic skills
workshops, fieldtrip, research
Introduction to the specialization

Lecturing Material

Assessment

- **80%: Assignment -- Individual report**
- **20%: Presentation --**

2013/2015-ES04: Integrated project environmental science											
Nr	Course/Topic	Lecture	Assignment	Workshop Case study Role play Exercise Lab session	Laboratory work	Fieldtrip - Fieldwork	Design exercise	SUM: contact hours	SUM: studyload hours	Lecturer(s)
1	Integrated project		60	46		16		62	122	Bijlsma, van Dam and others
2	Academic skills			8				8	8	van Dam
3	Introduction to specialization			8				8	8	various
	Total		60	62		16		78	138	
MSc module - UNESCO-IHE										

ENVIRONMENTAL SCIENCE

MASTERS PROGRAMME

Academic Year: 2013-2015
Specialization: Core Programme
Module Coordinator: Dam, A.A. van

Module Sheet

Module Name Environmental systems analysis	Module Code ES05TM	Credits 5

Target Group	Prerequisites
Participants in the Environmental Science MSc-programme at UNESCO-IHE	BSc in a topic appropriate for admission to UNESCO-IHE Environmental Science MSc-programme (e.g., biology, agronomy, animal science, etc.) Modules 1-4 of Environmental Science programme

Learning Objectives

Upon completion of the module participants will be able to..

- List and describe environmental systems analysis (ESA) concepts and methods, and in particular the Ecosystem Services framework
- Perform a problem analysis and stakeholder analysis for a given environmental system
- Perform an analysis of ecosystem functions and services and their drivers of change for a given environmental system
- Construct a simple dynamic simulation model of an environmental system
- Discuss critically the strengths, weaknesses, missing information, advantages and disadvantages of the analyses
- Communicate effectively the methods, results and conclusions of a case study (presentation and written report)

Topics and Learning Activities

Lectures Environmental Systems Analysis

Lectures with overview of module, learning goals, learning activities, and basic concepts of ESA. Lectures introducing ecosystem functions and services framework, Millennium Ecosystem Assessment, other concepts and frameworks for ecosystem functional analysis and assessment, scale aspects (temporal and spatial), examples of rivers and wetlands. Lecture introducing concept of drivers of change. Direct and indirect drivers, exogenous and endogenous drivers, impacts of drivers on decision makers and decision making at different spatial scales. Interactions between drivers. Examples of drivers of change. Case study Basse Cassemance, Senegal. Introduction to Bayesian Network models as tools for operationalizing causal network models of environmental systems. Bayes' theorem and conditional probability, components of a BN (nodes and links), conditional probability tables (CPTs), data requirements for BN models, example with case study of Nyando wetland, Kenya. Human well-being and livelihoods.

Learning Activities:

Lectures, total 12 hours

Problem analysis and conceptual models

Problem analysis and problem trees, rich pictures

Learning Activities:

Group exercise, 4 hours

Stakeholder analysis

Definitions of stakeholder and stakeholder analysis, importance and objectives of stakeholder participation in research and capacity development, primary and secondary stakeholders, identification of stakeholders and stages in stakeholder participation, strategic and participatory approach in stakeholder participation, stakeholder matrix, rich pictures, Venn diagrams, and influence and importance matrix

Learning Activities:

Group exercise, 4 hours

Guest lectures ESA

Guest lectures consist of the following topics:

1. Integrated Biodiversity Modelling, by Dr. Jan Janse and Mr. Wilfried van Rooij of the Netherlands Environmental Assessment Agency,

2. Ecosystem valuation, by Dr. Rudolf de Groot of the Environmental Systems Analysis group of Wageningen University.

Learning Activities:

Lectures, 6 hours

Exercise Environmental Systems Analysis

During this exercise, participants apply the ESA concepts to case studies of environmental systems in different parts of the world. Participants work in group to use functional analysis, DPSIR analysis and causal networks and produce the relevant diagrams and figures. This material will be used for producing an individual report on the case studies. Part of these exercises is a writing workshop with peer review during which participants practice and improve their academic writing skills.

Learning Activities:

Exercise 8 hours + writing workshop 6 hours

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Field trip DELTARES

During a visit to DELTARES in Delft, the DELTARES researchers present their work on modelling of ecosystems in various parts of the world. There is time for questions and discussion.

Learning Activities:

Field trip, 4 hours

Modelling group work/case study

Participants work in group to produce a simple dynamic simulation model of an environmental system. They use Stella as a modelling tool. They start by producing a conceptual model, then gather the data and information needed for constructing the mathematical model and for parameterization and calibration. The model is presented to the other participants during the last plenary session of the module.

Learning Activities:

Group work, 32 hours + final presentation, 4 hours

Lecturing Material

- Powerpoint presentations of all lectures
- Background reading materials consisting of scientific articles and other publications (list with reading materials to be provided at start of module)
- Case study descriptions and instructions for individual report and modelling group work

Assessment

- **40%: Written Exam (closed book) -- This is an exam covering all the material presented in the module. It consists of closed questions (Yes/No). At the beginning of week 3 of the module, participants can take this exam as a test which, when passed, gives participant a waiver for the exam.**
- **40%: Assignment -- This assignment consists of an individual report on the case study. The participants use the material developed during the exercises in the module and the text written during the writing workshop as building blocks for this individual report. Reports are judged by the module coordinator and (depending on the number of participants) other lecturers according to clear criteria that are provided to the students before the exercise.**
- **20%: Presentation -- This is a presentation made by each group about the Stella model developed during the group work in the last week of the module. Presentations are judged by two independent UNESCO-IHE lecturers who were not involved in the rest of the ESA module.**

2013/2015-ES05TM: Environmental systems analysis										
Nr	Course/Topic	Lecture	Assignment	Workshop Case study Role play Exercise Lab session	Laboratory work	Fieldtrip - Fieldwork	Design exercise	SUM: contact hours	SUM: studyload hours	Lecturer(s)
1	Introduction ESA	2						2	6	van Dam
2	Ecosystem functions and services	4						4	12	Hes/van Dam
3	Drivers of change in ecosystems	2						2	6	van Dam
4	Bayesian Networks	2						2	6	van Dam
5	Human well-being and livelihoods	2						2	6	van Dam
6	Problem analysis & conceptual models		4						4	Hes
7	Stakeholder analysis		4						4	Hes
8	Integrated biodiversity modelling	4						4	12	Janse/van Rooij
9	Ecosystem valuation	2						2	6	de Groot
10	Field trip DELTARES						4	4	12	Kelderman/van Dam
11	Exercise ESA		8						8	van Dam
12	Group work (case study)	4		42				46	54	van Dam/Hes/Gettel
	Total	22	16	42			4	68	136	
MSc module - UNESCO-IHE										

MASTERS PROGRAMME

Academic Year: 2013-2015
Specialization: Water quality management
Module Coordinator: Kelderman, P.

Module Sheet

Module Name Water quality assessment	Module Code ES05W	Credits 5

Target Group	Prerequisites
Young and mid-career professionals (scientists, consultants, decision makers) with a background in Water management or Environmental science.	Preferably a bachelor's degree in chemistry, chemical engineering, biology, environmental science, hydrology, geography or equivalent. Basic knowledge in computer operations (MS-Windows; Office). Good command of English.

Learning Objectives

Upon completion of the module participants will be able to..

- Describe different water pollutant groups, their risks and fates, and ways of modelling these fates
- Describe and apply the different tools,criteria and assessment methods for succesful monitoring of surface waters in river basins
- Describe basic groundwater quality monitoring concepts
- Design sustainable water quality monitoring programmes for river basins

Topics and Learning Activities

Water quality monitoring

Water quality variables.
Natural water quality and pollution variables.
The monitoring cycle.
Items of the monitoring programme: why, what, where, how, how often.
Physico-chemical and biological water quality monitoring.
Basic concepts and applications of Aquatic Ecotoxicology in Water quality monitoring. Monitoring in the EU Water Framework Directive.
Exercise: optimization of water quality monitoring programmes. Groupwork: design of a river basin monitoring network.
Practical field&lab work: sampling, preservation, field analyses; Quality control in the laboratory.
Learning Activities:
Lectures, exercises, workshop, groupwork, lab and fieldwork

Data analysis and presentation

Use of statistics in water quality monitoring. Statistical tests: t-test, confidence intervals, Q-test etc.; non-parametric statistics. Applications: minimum sampling frequency; significant differences between two data sets, correlation between variables.
Introduction to more advanced techniques such as ANOVA and FACTOR analysis.
Hands-on computer exercises
Learning Activities:
Lectures, workshops, exercises

Groundwater quality monitoring

Sampling of groundwater. Basics of hydrogeology. Pollutants reactions and transport in groundwater. Design of a groundwater monitoring network.
Learning Activities:
Lectures

Water quality modelling

Introduction to Modelling: types of models and model components.
BOD-DO model in a river.
Spatial-Dynamic Modelling of nitrate in the Scheldt Catchment, using a GIS based nutrient model.
Modelling point and non-point sources. In-class exercise.
Learning Activities:
Lectures, computer exercises

Fieldtrips

(Liable to change): half-whole day visit(s) to water quality monitoring and modelling Institutions.

Learning Activities:
Fieldtrips

Lecturing Material

- P. Kelderman (2011) - Water quality and monitoring. UIHE lecture notes LN5/11/1.
- T.b.d. - Handout Applications of Aquatic Ecotoxicology for Water quality monitoring
- T.b.d. - Handout Design of a Water Quality Monitoring Network in a River Basin. Febr. 2014.
- P. Kelderman - Handout Data handling and presentation. Febr. 2014.
- J. van der Kwast - Exercises Water Quality Assessment using GIS-based modelling - Febr. 2014.
- J. van der Kwast - Handout Introduction to Modelling/Nitrate modelling in the Scheldt basin - Febr. 2013.
- G.F. Kruis and P. Kelderman - Handout Fieldwork water quality monitoring and Laboratory QA/QC. Febr. 2012.
- Compiled powerpoint slides on Groundwater monitoring; powerpoint slides on all above topics; additional materials: relevant info, fieldtrips materials, etc.

Assessment

- **60%: Written Exam (closed book) -- Topics: Surface water quality monitoring; Data handling; Groundwater quality monitoring.**
- **15%: Assignment -- Groupwork: presentation on Case study - design of a sustainable water quality monitoring programme in a specific river basin in a developing country**
- **10%: Lab Report -- Written individual report on field/labwork.**
- **15%: Assignment -- Writtem individual report on Exercise - GIS Water quality model of the Scheldt river basin.**

2013/2015-ES05W: Water quality assessment											
Nr	**Course/Topic**	**Lecture**	**Assignment**	**Workshop Case study Role play Exercise Lab session**	**Laboratory work**	**Fieldtrip - Fieldwork**	**Design exercise**	**SUM: contact hours**	**SUM: studyload hours**	**Lecturer(s)**
1	**Water Quality Monitoring**									
1.1.	Introduction			2				2	2	Kelderman
1.2.	Water quality monitoring and assessment	11		4	8			23	53	Kelderman, Kruis, external
1.3	Case study water quality monitoring						4	4	12	Kelderman, external
1.4	Workshop - New trends			4				4	4	Alfonso, Gettel
2	**Data analysis and presentation**	**4**		**8**				**12**	**20**	Kelderman, van Dam
3	**Water Quality Modelling**			**2**	**10**			**12**	**22**	van der Kwast/Kelderman
4	**Groundwater quality monitoring**	**6**						**6**	**18**	Foppen
6.	Fieldtrip					8		8	8	
	Exam		**3**						**3**	
	Total	**21**	**3**	**20**	**18**	**8**	**4**	**71**	**142**	
MSc module - UNESCO-IHE										

ENVIRONMENTAL SCIENCE

MASTERS PROGRAMME
Academic Year: **2013-2015**
Specialization: **Core Programme**
Module Coordinator: **Raj, E.R.**

Module Sheet

Module Name Environmental engineering	Module Code ES06T	Credits 5

Target Group	Prerequisites
Programme target group	Programme prerequisites

Learning Objectives

Upon completion of the module participants will be able to..
- Describe the basic chemical and biological processes and their engineering in water and wastewater treatment;
- Evaluate different approaches to wastewater treatment and select the best option for local conditions.

Topics and Learning Activities

Water treatment

Water is playing an essential role in relation with the environment and in this module it is shown, how man can actively intervene in its pollution. Man is using several simple and advanced techniques to produce reliable drinking water from groundwater and surface water

Learning Activities:

Lectures, workshop, fieldtrip

Wastewater treatment

To limit environmental pollution wastewater has to be treated; an overview of basic processes available for the treatment of domestic and industrial wastewater, with special emphasis on natural processes and systems that can be applied, is given in wastewater treatment

Learning Activities:

Lectures, laboratory.

Environmental Process Technology

For a better understanding of water and wastewater treatment the principles of mass balances, reaction kinetics and reactor design are discussed in environmental process technology

Learning Activities:

Lectures, workshop

Lecturing Material
- Lecture notes Water treatment
- Lecture notes + laboratory notes wastewater treatment
- Lecture notes EPT

Assessment

- **50%: Written Exam (closed book) -- Wastewater treatment**
- **25%: Assignment -- Water treatment**
- **25%: Assignment -- EPT**

2013/2015-ES06T: Environmental engineering										
Nr	Course/Topic	Lecture	Assignment	Workshop Case study Role play Exercise Lab session	Laboratory work	Fieldtrip - Fieldwork	Design exercise	SUM: contact hours	SUM: studyload hours	Lecturer(s)
	Water treatment		20	8				8	28	Buiteman
	Wastewater treatment, natural processes	16		16				32	64	van Bruggen, van der Steen, Lubberding, Kelderman
	Environmental process technology		20	16				16	36	Bijlsma
	Fieldtrip						4	4	12	
	Exam		2						2	
	Total	16	42	40			4	60	142	
MSc module - UNESCO-IHE										

MASTERS PROGRAMME

Academic Year: 2013-2015
Specialization: Core Programme
Module Coordinator: Douven, W.J.A.M.

Module Sheet

Module Name Water and environmental policy making	Module Code ES06M	Credits 5

Target Group	Prerequisites
The specialization is intended for professionals with an interest in environmental policy making in the water management (or related) context.	Programme prerequisites

Learning Objectives

Upon completion of the module participants will be able to..

- understand the nature of policy making as a continuous negotiation process
- identify the drivers of policy agendas and policy making decisions and explain them in terms of conflicting stakeholder interests
- apply basic tools and techniques to the planning and design of water and environmental policies
- interrelate water policies to other policy areas as well as to international environmental governance
- draw on the basic philosophy of team role management in negotiation processes

Topics and Learning Activities

Water Policy and the Policy Cycle

Introduction principles governance, the relationship governance and policy, policy as continuous negotiation driven by interests and agendas of stakeholders, areas of environmental policy, and overview over socio-economically and naturally driven water issues and policy areas

Learning Activities:

lectures, assignments and group discussions

Policy Planning and Design - Tools and Methods

Principles of planning, policy analysis and environmental assessment methods, overview over policy instruments, basics of policy enforcement, and approaches to public participation in policy design and decision-making, application of policy analysis tools to assess a water conflict case

Learning Activities:

lectures, classroom exercises, assignment (report) and group discussion/presentations

International Processes, Network Management, and Negotiation

Global Environmental Change as driver for policy changes and international, integrated approaches to water management, network management, and basic of negotiation based on teamrole analysis

Round Table Discussion and Fieldtrip

Roundtable discussion with high-level Dutch government and NGO representatives on participatory policy making, fieldtrip to the Dutch Delta Works

Learning Activities:

Groupwork and Fieldtrip

Lecturing Material

- Lectures
- Reader
- Handouts

Assessment

- **70%: Written Exam (closed book) --**
- **20%: Assignment --**
- **10%: Homework --**

2013/2015-ES06M: Water and environmental policy making											
Nr	**Course/Topic**	**Lecture**	**Assignment**	**Workshop Case study Role play Exercise Lab session**	**Laboratory work**	**Fieldtrip - Fieldwork**	**Design exercise**	**SUM: contact hours**	**SUM: studyload hours**	**Lecturer(s)**
1	**Water Policy and the Policy Cycle**									
1.1	Introduction EPM	2						2	6	Prof. J. Leentvaar, PhD, MSc
1.2	Environmental Policy and Water Governance	3	1					3	10	Prof. J. Leentvaar, PhD, MSc
1.3	Water Agendas: Societal Demands and Policy Making	2	1					2	7	Prof. J. Leentvaar, PhD, MSc
1.4	Water as Environmental Issue	2						2	6	Prof. J. Leentvaar, PhD, MSc
2	**Policy Planning and Design - Tools and Methods**									
2.1	Principles of Planning	2						2	6	H. Clouting, PhD
2.2	Policy Analysis: Process and Methods	2	1					2	7	Prof. J. Leentvaar, PhD, MSc
2.3	Environmental Assessments: Introduction to EIA/SEA	2						2	6	H. Clouting, PhD
2.4	Policy Design and Decision Making Process	4	1					4	13	Prof. J. Leentvaar, PhD, MSc
2.5	Cases on Water Conflicts (Assignment)		4						4	
3	**International Processes, Network Management, and Negotiation**									
3.1	Water Governance in the Anthropocene	2						2	6	Prof. J. Leentvaar, PhD, MSc
3.2	Network Management	6	4					6	22	Ir M. Bijlsma, MBA
3.3	A Teamrole Approach to Negotiation	4	4					4	16	Prof. J. Leentvaar, PhD, MSc
4	**Round Table Discussion**			**2**				**2**	**2**	
5	**Fieldtrip**						**8**	**8**	**24**	
	Exam		**3**						**3**	
	Total	**31**	**19**	**2**			**8**	**41**	**138**	
MSc module - UNESCO-IHE										

MASTERS PROGRAMME

Academic Year: 2013-2015
Specialization: Core Programme
Module Coordinator: Bruggen, J.J.A. van

Module Sheet

Module Name Wetlands for water quality	Module Code ES06W	Credits 5

Target Group	Prerequisites
Programme target group	Programme prerequisites

Learning Objectives

Upon completion of the module participants will be able to..

- assess the value of wetlands and explain the use of natural and constructed wetlands for the treatment of wastewater;
- describe the concept of wastewater treatment by wetlands;
- design and operate a wetland treatment system.

Topics and Learning Activities

Introduction on natural wetlands

what are wetlands, where are wetlands, wetland ecology, biodiversity, economics. The role of wetlands in the catchment: general aspects, hydrological aspects, wetlands as buffers and the role in relation to climate.

Learning Activities:

lectures, and video presentations.

Natural wetlands for wastewater treatment

the basic principles, the advantages and disadvantages, the risks. Examples in a temperate climate and examples in the tropics.

Learning Activities:

lectures, and video presentations.

Constructed wetlands for wastewater treatment

the different types, the design and criteria for design. Advantages and disadvantages. Constructed wetlands in The Netherlands, the tropics and the rest of the world.

Learning Activities:

lectures, and video presentations, field trip

Integrated wetland production systems

theory, examples, advantages, disadvantages, economics, nutrient flows. Modelling of integrated production systems.

Field visits.

Learning Activities:

lectures, and video presentations, assignment

Lecturing Material

- Lecture notes and case studies

Assessment

- **60%: Written Exam (closed book) --**
- **40%: Assignment --**

2013/2015-ES06W: Wetlands for water quality											
Nr	Course/Topic	Lecture	Assignment	Workshop Case study Role play Exercise Lab session	Laboratory work	Fieldtrip - Fieldwork	Design exercise	SUM: contact hours	SUM: studyload hours	Lecturer(s)
1	Introduction into the module	1						1	3	
2	Wetlands	8	2					8	26	
3	Wastewater treatment aspects	6						6	18	
4	Natural wetlands for water treatment	4						4	12	
5	Constructed wetlands	14						14	42	
6	Integrated production systems	6						6	18	
7	Fieldtrip					16		16	16	
8	Exam		3						3	
	Total	39	5			16		55	138	
MSc module - UNESCO-IHE										

ENVIRONMENTAL SCIENCE

MASTERS PROGRAMME

Academic Year: 2013-2015
Specialization: Environmental Science and Technology
Module Coordinator: Kelderman, P.

Module Sheet

Module Name Environmental monitoring and modelling	Module Code ES07T	Credits 5

Target Group	Prerequisites
Young and mid-career professionals (scientists, consultants, decision makers) with a background in Water management or Environmental science	Preferably a bachelor's degree in Chemistry, Biology, Environmental science, Hydrology, or related/equivalent. Basic knowledge in computer operations (MS Windows; Office). Good command of English

Learning Objectives

Upon completion of the module participants will be able to..

- Describe and apply main monitoring requirements and programmes for surface water, groundwater and air, and some common analytical techniques used therein.
- Describe and apply the different criteria for successful monitoring of lakes and rivers.
- Describe and apply basic Environmental Impact Assessment techniques.
- Describe and apply a number of water quality models as a tool in Environmental management.

Topics and Learning Activities

Water quality monitoring

Introduction on Environmental monitoring. Water quality parameters. Natural water quality and pollution parameters. The monitoring cycle. Items of the monitoring programme: why, what, where, how, how often. Fieldwork and sampling. Physico-chemical and biological water quality assessment. Monitoring in the EU Water Framework Directive. Practical field&lab work: sampling, preservation, field analyses; Quality control in the laboratory.

Learning Activities:

Lectures, exercises, lab and fieldwork

Groundwater monitoring

Sampling of groundwater. Basics of hydrogeology. Pollutants reactions and transport in groundwater. Design of a groundwater monitoring network.

Learning Activities:

Lectures

Air quality monitoring and modelling

Impacts of main air quality pollutants. Emission and dispersion under different meteorological conditions. Air quality monitoring: background; networks (EMEP, GEMS, etc.); automated instrumentation. Examples of air quality modesl: CAR, LOTOS, etc. Case studies and exercises: Emission data base; setting up a monitoring network; hands-on computer exercises with air quality models.

Learning Activities:

Lectures, exercises

Water quality modelling

Introduction to Modelling: types of models and model components. BOD-DO model in a river. Spatial-Dynamic Modelling of Nitrate in the Scheldt Catchment, using a GIS based nutrient model. Modelling point and non-point sources. In-class exercise.

Learning Activities:

Lectures, exercises

Environmental Impact assessment

Objectives of EIA; participants and approaches. Screening tables. Scoping and mitigation. Identification of impacts; Impact matrix: scaling and weighing. Factors of success; cost of EIA. Practical examples such as Impacts of dams and reservoirs. Hands-on exercises EIA.

Learning Activities:

Lectures, exercises

Laboratory Environmental monitoring

Introduction to the different techniques and instruments. Analysis of heavy metals with AAS: sample destruction, use of conventional and graphite oven AAS. Analysis of organic micropollutants with GC; standards; detectors.

Quality Control in AAS and GC.

Learning Activities:

Laboratory work

Fieldtrip

Liable to change: Visits are planned to water quality monitoring/modelling as well as to air quality monitoring Institutions.

Learning Activities:

Excursions

Lecturing Material

• P. Kelderman (2011) - Water quality and monitoring. UIHE lecture notes LN5/11/1.

• G.F. Kruis and P. Kelderman (2011) - Handout Fieldwork water quality monitoring and Laboratory QA/QC. Febr. 2011.

• M.P. Keuken/J.S. Henzing (2014). Handout Air quality monitoring and modelling. U

• J. van der Kwast - Exercises Water Quality Assessment using GIS-based modelling - Febr. 2014.

• J. van der Kwast - Handout Introduction to Modelling/Nitrate modelling in the Scheldt basin - Febr. 2013.

• Compiled powerpoint slides on Groundwater monitoring; on Environmental Impact Assessmenmt. Powerpoint slides on all above topics; additional materials: relevant info, fieldtrips materials, etc.

Assessment

• 70%: Written Exam (closed book) -- Topics: water quality monitoring; water quality modelling; groundwater quality monitoring and modelling; air quality monitoring and modelling

• 20%: Assignment -- Written individual assignment on EIA

• 10%: Lab Report -- Written individual report on field/labwork

2013/2015-ES07T: Environmental monitoring and modelling											
Nr	**Course/Topic**	**Lecture**	**Assignment**	**Workshop Case study Role play Exercise Lab session**	**Laboratory work**	**Fieldtrip - Fieldwork**	**Design exercise**	**SUM: contact hours**	**SUM: studyload hours**	**Lecturer(s)**
1	**Water quality and monitoring**									
1.1.	Introduction on Environmental monitoring			2				2	2	McClain
1.2.	Water quality monitoring	7			8			15	37	Kelderman, Kruis
2	**Groundwater monitoring and modelling**	**6**						**6**	**18**	Foppen
3	**Air quality monitoring and modelling**	**6**		**6**				**12**	**24**	Henzing
4	**Water quality modelling**			**2**	**10**			**12**	**22**	van der Kwast/Kelderman
5	**Environmental Impact assessment**				**10**			**10**	**20**	Vis, Clouting
6	**Laboratory Environmental monitoring**			**8**				**8**	**8**	Kruis
	Fieldtrip					**8**		**8**	**8**	
	Exam		**3**						**3**	
	Total	**19**	**3**	**18**	**28**	**8**		**73**	**142**	
MSc module - UNESCO-IHE										

ENVIRONMENTAL SCIENCE

MASTERS PROGRAMME

Academic Year: 2013-2015
Specialization: Core Programme
Module Coordinator: Hamdard, M.

Module Sheet

Module Name Environmental planning and implementation	Module Code ES07MW	Credits 5

Target Group	Prerequisites
Young and mid-career professionals (scientists, decision-makers) with a background in environmental management, water management and / or watershed management.	Affinity with environment policy and enforcement, development economics, and preferably experience in water management arena. Good command of English.

Learning Objectives

Upon completion of the module participants will be able to..

- Explain the concept and importance of sustainable development into environmental planning and management
- Apply and discuss economic valuation methods and policy instruments for environmental policy
- Explain principles, processes and methods of environmental assessment (EIA-SEA) and be able to apply them in water related plans, programmes and projects
- Apply basic theories behind policy enforcement, monitoring and evaluation to master effective environmental policies
- Use environmental information systems to support planning and management

Topics and Learning Activities

Sustainable Development
Environmental Planning Process, Spatial planning
Environmental Assessments (EIA/SEA)
Environmental Economics
Environmental Policy Enforcement

Lecturing Material

- Lecture Notes
- Additional Reading Materials
- Lecture powerpoint slides

Assessment

• 55%: Written Exam (closed book) -- - Sustainable Development
- Spatial Planning
- Environmental Policy & Enforcement
- Strategic Environmental Assessment
• 30%: Assignment -- Environmental Economics
• 15%: Assignment -- Environmental Impact Assessment

2013/2015-ES07MW: Environmental planning and implementation										
Nr	Course/Topic	Lecture	Assignment	Workshop Case study Role play Exercise Lab session	Laboratory work	Fieldtrip - Fieldwork	Design exercise	SUM: contact hours	SUM: studyload hours	Lecturer(s)
1	Sustainable Development	6	8					6	26	Hoekstra
2	Environmental Planning	2						2	6	Hamdard
3	Environmental Economics	14						14	42	Bijlsma
4	Environmental Assessment (EIA/SEA)	10	8					10	38	Vis,Clouting, Hamdard
5	Environmental Policy Enforcement	5	6					5	21	Douven, Guest lecture
6	Fieldtrip					8		8	8	Hamdard
7	Exam		3						3	
	Total	37	25			8		45	144	
MSc module - UNESCO-IHE										

ENVIRONMENTAL SCIENCE

MASTERS PROGRAMME

Academic Year: 2013-2015
Specialization: Core Programme
Module Coordinator: Siebel, M.A.

Module Sheet

Module Name Cleaner production & the water cycle	Module Code ES08T	Credits 5

Target Group	Prerequisites
The module is directed at engineers and scientists working in the urban or industrial water field and wanting to have a better grasp at the efficient dealing with water. As such the module is of interest to engineers and scientists in the fields of urban, municipal and industrial sanitation, water-related chemistry and biology, water resources, process design and implementation.	Participants should possess a BSc degree in an area relate environmental engineering and science, microbiology, chemical engineering, chemistry, public health, etc. Professional experience in the water field helps to fully grasp the significance of the back-ground thinking relayed in the module and of the practical benefits of some of the concepts presented. A good command of the English language is required.

Learning Objectives

Upon completion of the module participants will be able to..

- suggest options for preventing pollution within urban and industrial water management settings;
- assess the environmental impact of products and processes;
- suggest treatment/disposal methods for industrial wastewater from which the value has been taken out;
- understand the importance of environmental management systems in the industrial context;
- suggest methods for the management of wastewater nutrients using a three steps approach;
- make basic calculations related to life cycle analysis.

Topics and Learning Activities

Introduction to the field of Cleaner Production

What is Cleaner Production (CP)? How did it develop, in what context? How can Cleaner Production be applied to industrial, domestic, institutional management? How does Cleaner Productin relate to Water Management

Learning Activities:

Introductory lectures, group discussions, application in own (home) conditions

Life Cycle Analysis, Eco Design and Material Flow Analysis

What is Life Cycle Analysis (LCA)? What does it aim at? How does it work in practice and what is the practical significance of LCA?

Learning Activities:

Lectures, examples, calculational exercises

Environmental Management Systems

What is Environmental Management, what are Environmental Management Systems (EMS)? What are the major components? How does ESM relate to environmental issues? What is the industrial perspective of ESM? Does is EMS applied to industrial systems?

Learning Activities:

Lectures, group studie, group exercises, calculation examples

Urban Water Management

What is Urban Water Management (UWM)? What is the role of CP in UWS? What practical benefit can be achieved when CP is applied to UWM?

Learning Activities:

Lectures, movie, discussion, learning by practice, designing your own urban water saving system

Industrial Water Management

What is Industrial Water Management (IWM)? What does industry management water? WHat are pitfalls, what are options? What is the role of CP in UWM?

Learning Activities:

Lectures, group exercises,calculations, discussion

Nutrient Management

What is nutrient management? How does it relate to water management? What are the benefits of managing nutrients in the water phase? What are consequences?

Learning Activities:
Lectures, movie, calculation exercises, group discussion, application exercises to own conditions

Lecturing Material

- Lecture notes in electronic form
- Reading materials published by others
- Case studies
- Movies
- Group work, group discussions, role play

Assessment

• 60%: Written Exam (open book) -- Examination is on-line using MOODLE
• 35%: Assignment -- Assessment Assignment consists of 3 or 4 exercises and a finel report
• 5%: Presentation -- Part of the 5% from Presentation includes contribution in class, presence, initiative, creativity

2013/2015-ES08T: Cleaner production & the water cycle											
Nr	Course/Topic	Lecture	Assignment	Workshop Case study Role play Exercise Lab session	Laboratory work	Fieldtrip - Fieldwork	Design exercise	SUM: contact hours	SUM: studyload hours	Lecturer(s)
	Introduction to the field of Cleaner Production			4				4	4	Siebel
	Tools in cleaner production	2						2	6	Siebel
	Life cycle analysis	4						4	12	Dijk
	Environmental management systems	2	4	2				4	12	Stans
	Urban water management		2	4				4	6	Siebel
	Industrial water management	4						4	12	Hill
	Recovery and re-use of wastewater	4						4	12	van der Steen
	Simulation game			6				6	6	Siebel
	Group exercise	2	8	38				40	52	Siebel
	Field trip		4			8		8	12	Siebel
	Exam		3						3	
	Total	18	21	54		8		80	137	
MSc module - UNESCO-IHE										

WATER MANAGEMENT

MASTERS PROGRAMME

Academic Year: 2013-2015
Specialization: Core Programme
Module Coordinator: Jaspers, F.G.W.

Module Sheet

Module Name Water and environmental law	Module Code WM08	Credits 5

Target Group	Prerequisites
Students of the Masters of Science Programmes of Water Management and Environmental Science and Technology . Practitioners with a relevant Bachelor's degree in a water related discipline	Preferably a relevant water science and engineering related bachelor's degree or equivalent; affinity with water management; good command of English.

Learning Objectives

Upon completion of the module participants will be able to..

- demonstrate and apply knowledge in the fields of national and international water and environmental law and to perceive and discuss the main concepts, theories, discourses
- apply, compose and recreate legal instruments to operationalize integrated water resources management (water quantity and water quality)
- demonstrate and apply knowledge in the field of contract management for use in water projects.
- analyze and prepare a contract for a specific situation
- describe and apply concepts of water allocation, water rights and international benefit sharing
- discuss and explain complexity of decision making for water allocation in national and international rivers.

Topics and Learning Activities

Introduction to national and international water law and institutions
Comparative environmental law and water law principles. Innovative legal and policy instruments; changing patterns of global governance. Introduction to the UN system. Introduction to the Law of Treaties. Key international environmental and water treaties. Principles of dispute resolution.

Processes of water policy development
Water sector reform, functional decentralization and development and benchmarking of river basin organizations.

Systems of (transboundary) water allocation and (customary) water rights
Shared vision and strategy development, water and benefit sharing from international rivers.

Regulations for international and trans-boundary water quality management
EU Framework Directive, Dutch water policy and organizations, application of environmental standards and others.

Lecturing Material

- F.G.W. Jaspers - Chapters in Water and Environmental Resources Law, UNESCO-IHE Lecture Notes.
- F.G.W. Jaspers - Role Play International Rivers, UNESCO-IHE Lecture Note.
- F.G.W. Jaspers - Introduction in Contract Management, UNESCO-IHE Lecture Note.
- J. Gupta - International Water Law and Institutions, UNESCO-IHE Lecture Note.
- P. van der Zaag e.a - Legislation of International Waters, UNESCO-IHE Lecture Note.
- Various inputs from guest lecturers.

Assessment

- **60%: Written Exam (closed book) -- Open Questions**
- **40%: Assignment -- Assignment contract design (Workshop)**

2013/2015-WM08: Water and environmental law											
Nr	**Course/Topic**	**Lecture**	**Assignment**	**Workshop Case study Role play Exercise Lab session**	**Laboratory work**	**Fieldtrip - Fieldwork**	**Design exercise**	**SUM: contact hours**	**SUM: studyload hours**	**Lecturer(s)**
1	**Water Law**									
1.1	Introduction Water Law	2						2	6	Jaspers
1.2	International Water Law	2		4				6	10	Gupta
1.3	Legal Instruments Environmental Law	2		4				6	10	Jaspers
1.4	Contract Management	2						2	6	Jaspers
1.5	International Environmental Law	4		2				6	14	Gupta
1.6	Case studies Environment / Forestry			4				4	4	Gupta
2	**Legal Arrangements**									
2.1	Contract Management Case Study / Workshop			4				4	4	Jaspers
2.2	Trans-boundary Water Allocation	4						4	12	Van der Zaag/Shubber
2.3	Beneift Sharing	4						4	12	Van der Zaag/Shubber
2.4	WQM Regulation	2		2				4	8	Hendry
2.5	EUWFD	2		2				4	8	Hendry
3	**Organisations**									
3.1	Contract Management			4				4	4	Jaspers
3.2	River Basin Organization (Intro)	4		2				6	14	Jaspers
2.2	Visit International Court of Justice					4		4	4	Shubber
2.4	Case: Customary Water Rights			6				6	6	van der Zaag/Wessels
	Assignment		**12**						**12**	
	Exam		**3**						**3**	
	Total	**28**	**15**	**34**		**4**		**66**	**137**	
MSc module - UNESCO-IHE										

ENVIRONMENTAL SCIENCE

MASTERS PROGRAMME

Academic Year: 2013-2015
Specialization: Core Programme
Module Coordinator: Bruggen, J.J.A. van

Module Sheet

Module Name Foreign fieldtrip and fieldwork ES	Module Code ES09TMW	Credits 5

Target Group	Prerequisites
Programme target group	Programme prerequisites

Learning Objectives

Upon completion of the module participants will be able to..

- The international fieldtrip is an exposure tour to interesting sites in Europe and is aimed to become familiar with environment-related organisations and companies in Western Europe.
- After completion of the fieldwork participants will be able to conduct experimental fieldwork.

Topics and Learning Activities

International Fieldtrip

Excursions to environment-related organisations and companies in Western Europe.

Learning Activities:
Excursions

Fieldwork

In the integrated fieldwork, hydrological, chemical and biological measurements will be integrated into an overall evaluation of the water quality in a river basin in relation to land use.

Learning Activities:
Fieldwork in a river system

Lecturing Material

- Practical and field guides

Assessment

- **100%: Integrated in modules --**

2013/2015-ES09TMW: Foreign fieldtrip and fieldwork ES											
Nr	**Course/Topic**	**Lecture**	**Assignment**	**Workshop Case study Role play Exercise Lab session**	**Laboratory work**	**Fieldtrip - Fieldwork**	**Design exercise**	**SUM: contact hours**	**SUM: studyload hours**	**Lecturer(s)**
1.0	International fieldtrip					88		88	88	van Bruggen
2	**Fieldwork**									
2.1	Introduction	1					4	5	15	deRuyter, Venneker
2.2	Land use and soil quality		4	6		4		10	14	Hartemink
2.3	Chemical & biological water quality					4		4	4	deRuyter, Kruis
2.4	GIS					4		4	4	vandeVeer
2.5	Biomonitoring	1						1	3	Rousseau
3.0	Data analysis		8						8	deRuyter, vandeVeer
	Total	**2**	**12**	**6**		**100**	**4**	**112**	**136**	
MSc module - UNESCO-IHE										

MASTERS PROGRAMME

Academic Year: 2013-2015
Specialization: Limnology and Wetland Management
Module Coordinator: Hes, E.M.A.

Module Sheet

Module Name Wetlands for livelihoods and conservation	Module Code ES09L	Credits 5

Target Group	Prerequisites
Programme target group	Programme prerequisites

Learning Objectives

Upon completion of the module participants will be able to..

- understand the concept of ecosystem functions and services, and means of assessing it;
- develop adaptive management for wetlands in response to climate change;
- analyse problems and formulate objectives according to the Objective Oriented Planning (OOP) method;
- analyse systematically the role that stakeholders have in wetland planning and management;
- develop and carry out stakeholder interviews and surveys;
- construct a wetland management plan based on the guidelines of the Ramsar Convention.

Topics and Learning Activities

Ecosystem functions and services

Learning Activities:
lectures, field-work and data analysis

Climate change as a driver of change in wetland management planning

Learning Activities:
lectures and exercises

Objective Oriented Planning

Developing a wetland management plan according to the guidelines of the Ramsar Convention

Learning Activities:
lectures, field-work and case study

Stakeholder analysis and participatory approaches

Learning Activities:
lectures, field-work, case study and role play

Lecturing Material

- Case study descriptions
- PowerPoint presentations
- Selected scientific and other publications

Assessment

- **40%: Written Exam (closed book) --**
- **40%: Assignment -- Individual report and performance**
- **20%: Presentation -- Groupwork presentation**

2013/2015-ES09L: Wetlands for livelihoods and conservation											
Nr	Course/Topic	Lecture	Assignment	Workshop Case study Role play Exercise Lab session	Laboratory work	Fieldtrip - Fieldwork	Design exercise	SUM: contact hours	SUM: studyload hours	Lecturer(s)
	Ecosystem functions and services	8		4		16		28	44	
	Climate change as a driver of change in wetland management planning	8		4				12	28	
	Objective Oriented Planning	2		16		16		34	38	
	Stakeholder analysis and participatory approaches	2		14		8		24	28	
	Examination		2						2	
	Total	20	2	38		40		98	140	
MSc module - UNESCO-IHE										

ENVIRONMENTAL SCIENCE

MASTERS PROGRAMME

Academic Year: 2013-2015
Specialization: Core Programme
Module Coordinator: Gettel, G.M.

Module Sheet

Module Name Aquatic ecosystems: processes and applications	Module Code ES10TWL	Credits 5

Target Group	Prerequisites
Programme target group (Participants in the programmes at IHE) and qualified short course participants	Programme prerequisites (BSc in a topic appropriate to UNESCO-IHE programme) and basic knowledge of aquatic ecology.

Learning Objectives

Upon completion of the module participants will be able to..

- Conduct laboratory techniques used for basic limnological studies. Specifically, you will be able to measure physical-chemical properties, chlorophyll a concentration in seston and periphyton; measure and calculate primary production and community respiration, measure nutrient concentration and turbidity, calculate and measure ash free dry mass, and perform zooplankton counts.
- Develop a research question based on the experimental design.
- Analyze data using either statistical or modeling techniques to answer your research question.
- Produce a report in the format of a scientific article that presents your research question, the data supporting it, and a discussion of your results, including a review of relevant literature.
- Critically analyze your colleagues' work in the form of a professional peer review.

Topics and Learning Activities

Eutrophication in shallow-lake ecosystems

A mesocosm experiment will be used to analyse the effects of eutrophication in shallow lakes and to familiarise participants with techniques that are common in ecological research. Ample attention will be paid to the development of a critical scientific approach, including study design, statistical analysis and data presentation. Lectures on ecological processes and human impacts on aquatic ecosystems will provide the necessary theoretical background.

Learning Activities:

Students will conduct laboratory experiments to generate a data set, which they will analyze using appropriate tools. Students will then write a scientific report and perform a peer review.

Lecturing Material

Assessment

• 80%: Assignment -- The scientific report serves as the exam and the bulk of the grade for this course.
• 10%: Assignment -- The peer review will comprise 10% of the grade for this course.
• 10%: Presentation -- Students will be asked to present conclusions from in-class discussions and exercises. This mark would be more accurately called "class participation."

2013/2015-ES10TWL: Aquatic ecosystems: processes and applications										
Nr	Course/Topic	Lecture	Assignment	Workshop Case study Role play Exercise Lab session	Laboratory work	Fieldtrip - Fieldwork	Design exercise	SUM: contact hours	SUM: studyload hours	Lecturer(s)
	Lecture	**14**						**14**	**42**	Gettel, Irvine
	Laboratory Work				**16**			**16**	**32**	Gettel, Irvine
	In-class activity (data analysis, group work)			**44**				**44**	**44**	Gettel, Irvine
	Paper Writing and Review		**20**						**20**	Gettel, Irvine
	Total	**14**	**20**	**44**	**16**			**74**	**138**	
MSc module - UNESCO-IHE										

WATER MANAGEMENT

MASTERS PROGRAMME

Academic Year: 2013-2015
Specialization: Elective
Module Coordinator: Kemerink, J.S.

Module Sheet

Module Name Institutional analysis	Module Code WRM10	Credits 5

Target Group	Prerequisites
Young and Mid-career professionals who are 1) working at middle and upper management level in an organization in the water sector, 2) employed in policy making institutions in the water sector or 3) working for organizations engaged in management of water resources and water services.	Mandatory: High level of ability to read and discuss academic articles and book chapters in English; willingness to engage in social science theory and analytical frameworks. Preferred: completion of the Water Governance module.

Learning Objectives

Upon completion of the module participants will be able to..

- Analyze the role of institutions in water management.
- Summarize and compare different approaches to institutional analysis linked to different schools of thought.
- Apply these approaches for analyzing cases of water management.

Topics and Learning Activities

Approaches to Institutional Analysis

In discussing approaches to institutional analysis, different conceptual approaches will be presented. These approaches include the Institutional Analysis and Development Framework, Institutional Bricolage, Institutional Isomorphism and Legal Pluralism. In discussing these approaches we will highlight different streams in thinking about institutions and how these institutions develop.

Learning Activities:

Each approach will be elaborated upon through a presentation/lecture and through tutorials on related scientific articles. One session will be organized to specifically contrast different analytical approaches and to discuss these approaches using a documentary as an example.

Case studies highlighting different approaches to institutional analysis

In a case study different institutional approaches are visible. In the second week of the module, these different institutional approaches will be illustrated by a number of case studies. Case studies include the Tennesse Valley Authority, the water user association model, and a case of soil erosian in Ethiopia. Discussing different institutional approaches through case studies is aimed at highlighting the usefulness of engaging with a particular case using different conceptual approaches.

Learning Activities:

Each case study will be developed through a lecture/presentation.

Institutions and socio-ecological change

In this block, we aim to place institutions within a broader socio-ecological context. 'Nature and ecological conditions and processes do not operate separately from social processes, and [...] actually existing socionatural conditions are always the result of intricate transformations of pre-existing configurations that are themselves inherently natural and social' (Swyngedouw 1999:445). Institutions are interdependent on and interact with social, ecological and technological processes. Understanding institutions thus requires these institutions to be analyzed within a broader social, technological and ecological framework. In this third block the relationship between institutions and socio-ecological change is investigated.

Learning Activities:

This topic will be developed through a series of lectures.

Lecturing Material

• Students will be provided a list of articles that are required reading. It should be noted that students are expected to read and understand a considerable number of articles (approximately 15).

Assessment

• 50%: .. -- The Final Assessment is done by way of an essay which has to be written. This essay concerns an anaysis of institutions visible in a case study. The student is exepected to identify and analyze different institutional approaches in the case study and also link these institutions to the articles that have been read for this module.

• 15%: Assignment -- Reading assignment 1

• 15%: Assignment -- Reading assignment 2

• 20%: Assignment -- Reading assignment 3

2013/2015-WRM10: Institutional analysis											
Nr	Course/Topic	Lecture	Assignment	Workshop Case study Role play Exercise Lab session	Laboratory work	Fieldtrip - Fieldwork	Design exercise	SUM: contact hours	SUM: studyload hours	Lecturer(s)
1	Introduction to the Module	1						1	3	Kemerink and Smit
2	Institutional Analysis	2						2	6	Kemerink and Smit
3	Institutional Analysis and Development Framework: Ostrom	2						2	6	Castro
4	Institutional Bricolage	2						2	6	Cleaver
5	Institutional Isomorphism	2						2	6	Schwartz
6	Legal Pluralism	2						2	6	Kemerink
7	Case Water User Association	2						2	6	Kemerink and Rusca
8	Tennessee Valley Authority	2						2	6	Bolding
9	Gender and Institutions	2						2	6	Zwarteveen
10	Formality and Informality	2						2	6	Schwartz
11	Institutions and Socio-Ecological Change	4						4	12	Ahlers
12	Case Erosian in Ethopia	2						2	6	Smit
14	Assignments		60						60	Kemerink and Smit
13	Tutorials			4				4	4	
	Total	25	60	4				29	139	
MSc module - UNESCO-IHE										

ENVIRONMENTAL SCIENCE

MASTERS PROGRAMME

Academic Year: 2013-2015
Specialization: Core Programme
Module Coordinator: Siebel, M.A.

Module Sheet

Module Name Solid waste management	Module Code ES11T	Credits 5

Target Group	Prerequisites
Engineers, academicians, staff from Non-Government Organizations, Community-based Organizations, politicians, health officials, students, scientists, local, regional or national government officials, etc., involved or interested in the management of solid waste.	1) Involved in or familiar with one or more of the key elements of solid waste management, or 2) having studied the topic in a formal educational setting, or 3) having a university engineering degree.

Learning Objectives

Upon completion of the module participants will be able to..

- suggest options for waste reduction at source so as to reduce quantities of waste generated;
- choose from an array of options to turn waste into economic goods;
- suggest treatment/disposal methods for waste from which the value has been taken out and to make basic calculations related to the conceptual design thereof;
- assess the impact of waste and waste management on other environmental compartments;
- roughly assess financial consequences of proposed management aspects in SWM;
- conceptually develop a solid waste management scheme for an urban area.

Topics and Learning Activities

1) Introduction & Stakeholders
what is solid waste? what are the key problems (social, financial, environmental)? who are involved?
Learning Activities:
lecture, group activity/learning from each other, role play

2) Generation, collection & separation
How/why is SW generated? how can generation be reduced? what are collection schemes & means, what means waste separation? at what point in the process? what are advantages? how can separation/reuse be stimulated?
Learning Activities:
lecture, group activity/learning from each other, exercise, role play,

3) Biological processes, composting, digestion
Aerobic and anaerobic conversion of waste organics, process characteristics, fields of application, impacts on waste reduction
Learning Activities:
lecture, calculation exercise, laboratory experiment

4) Landfill technology, CDM, MBT and Incineration
What are main waste management technolgies? in more or in less developed countries? design elements, application areas? GHG issues
Learning Activities:
lecture, group activity/learning from each other, calculation exercise

5) Transboundary issues in SWM
What is Basel Convention? what is transboundary waste transport, processing and storage? What are environmental, social, economic aspects thereof?
Learning Activities:
lecture, group activity/learning from each other, role play,

6) Prevention & Recycling
How can waste generation be reduced? what are policy, economic tools? How can generated waste quickest be brought into the economic cycle?
Learning Activities:
lecture, group activity/learning from each other, calculation exercise

7) SWM planning and financing
How can all possible SWM pieces be put together to design a waste management system for a build-up area that is financially, socially and environmentally sustainable?
Learning Activities:

group activity/learning from each other, exercise, role play

Lecturing Material

• 1) PPT's; reviewed paper; BOOK: Waste Technology and Management; BOOK: Vital waste statistics
• 2) PPT's; reviewed paper; BOOK: From waste to resource; BOOK: Solid Waste Management in World Cities
• 3) PPT's; reviewed paper; BOOK: Waste Technology and Management; Video: Anaerobic degradation processes
• 4) PPT's; reviewed paper; BOOK: Waste Technology and Management; Video Bioreactor Landfill; UNEP SWM Landfill chapter
• 5) PPT's; reviewed paper; BOOK: Waste Technology and Management
• 6) PPT's; reviewed paper; BOOK: Waste Technology and Management
• 7) papers on planning practice

Assessment

• 60%: Written Exam (open book) -- MOODLE multiple choice
• 35%: Assignment -- All assignments together
• 5%: Presentation -- Participation in class or fora

2013/2015-ES11T: Solid waste management											
Nr	Course/Topic	Lecture	Assignment	Workshop Case study Role play Exercise Lab session	Laboratory work	Fieldtrip - Fieldwork	Design exercise	SUM: contact hours	SUM: studyload hours	Lecturer(s)
1	Introduction	6						6	18	Siebel
2	Waste prevention	4						4	12	Dijk
3	Exercise household waste generation			9				9	9	Siebel
4	Waste collection/ source separation	3						3	9	
5	Composting and biogas	6						6	18	Valencia
6	Excursion					4		4	4	Siebel
7	Informal sector	4						4	12	Rotter
8	Material cycles			4				4	4	Rotter
9	Landfill processes	3						3	9	Valencia
10	Landfill technology	3						3	9	Valencia
11	Mechanical biological treatment	4						4	12	Rotter
12	Lab landfill			3				3	3	Rotter
13	Integrated planning			8				8	8	Siebel
14	Presentations			2				2	2	Siebel
15	Assignments		13						13	
16	Exam		2						2	
	Total	33	15	26		4		63	144	
MSc module - UNESCO-IHE										

WATER MANAGEMENT

MASTERS PROGRAMME

Academic Year: 2013-2015
Specialization: Water Resources Management & Water Quality Management
Module Coordinator: Jiang, Y.

Module Sheet

Module Name Watershed and river basin management	Module Code ES11MW	Credits 5

Target Group	Prerequisites
Young and mid-career professionals (scientists, decision-makers) with a background in water management, environmental management, and / or watershed management.	Affinity with hydrology, development economics, agronomy or geography (preferably a relevant water science or engineering related bachelorâ€™s degree or equivalent) and preferably experience in watershed and / or river basin management. Good command of English.

Learning Objectives

Upon completion of the module participants will be able to..

- describe the main natural and anthropogenic interactions at a watershed scale; and how they can be aggregated to rive basin scale
- describe the role of water in sustaining different land uses, including ecosystems
- understand the watershed planning and management approaches, specifically in terms of soil and water management
- explain temporal and spatial scales issues in hydrology
- characterize the fundamental economic issues in watersheds and river basins and the role of economic valuation of acquatic ecosystem services in watershed and river basin management

Topics and Learning Activities

Introduction

This section introduces watershed and river basin management

Learning Activities:

Lecture, group exercise/workshop

Biophysical processes and anthropogenic interactions

This section overviews biophysical processes and interactions with human activitiies in watersheds and river basins, covering soil & water management, watershed hydrology and human interventions, environmental flow, and grounwater management

Learning Activities:

Lecture, group exercise/workshop

Watershed and river basin planning

This section describes the planning process of watershed and river basin management, including technical and participatior tools to support planning processes

Learning Activities:

Lecture, group exercise/workshop

Watershed economics

This section introduces and characterises the fundamental economic issues in watersheds and river basins, explain the relevance and role of economics and economic valuation in watershed and river basin management

Learning Activities:

Lecture, group exercise/workshop

Watershed and river basin management

This section synthesizes the institutional aspects in watershed and river basin management, explains transboundary interdependencies and cooperation, and presents a case study of watershed and river basin management in the real world

Learning Activities:

Lecture, group exercise/workshop

Role play- ShaRiva

This group excercise uses hydrological simulation as a decision support tool to help understand the interdependency of different stakeholders and the importance of communication and cooperation to effective watershed and river basin management

Learning Activities:

group excercise

Field trip

Lecturing Material

- Lecture Notes
- Role play reading materials
- Lecture powerpoint slides
- Additional reading materials

Assessment

- **70%: Written Exam (closed book) --**
- **30%: Assignment --**

2013/2015-ES11MW: Watershed and river basin management											
Nr	**Course/Topic**	**Lecture**	**Assignment**	**Workshop Case study Role play Exercise Lab session**	**Laboratory work**	**Fieldtrip - Fieldwork**	**Design exercise**	**SUM: contact hours**	**SUM: studyload hours**	**Lecturer(s)**
1	**Introduction**			**2**				**2**	**2**	Jiang/Hamdard
2	**Biophysical processes and anthropogenic interactions**									
2.1	Soil & Water Management	6						6	18	Van der Zaag
2.2	Watershed hydrology and human interventions	4						4	12	Mul
2.3	Environmental flow allocation	4						4	12	McClain
2.4	Groundwater Management	4						4	12	Guest Lecturer
3	**Watershed and river basin planning**									
3.1	Planning processes	2						2	6	Douven
3.2	Technical tools to support planning processes	2						2	6	Mohamed
3.3	Participatory tools to support planning processes	2						2	6	Kemerink
4	**Watershed economics**									
4.1	Fundamental economic issues in watersheds and river basins	3						3	9	Jiang
4.2	Economic valuation of aquatic ecosystem services	3						3	9	Jiang
5	**Watershed and river basin management**									
5.1	Institutional aspects in watershed and river basin management	2						2	6	Douven
5.2	Transboundary Interdependencies and cooperation	2						2	6	Douven
5.3	Case Study	2						2	6	Guest Lecturer
6	**Role-Play SHA-RIVA**		**20**						**20**	Mul/Jiang/Hamdard
7	**Field trip**					**4**		**4**	**4**	Jiang
	Exam		**3**						**3**	
	Total	**36**	**23**	**2**		**4**		**42**	**137**	
MSc module - UNESCO-IHE										

MASTERS PROGRAMME

Academic Year: 2013-2015
Specialization: Core Programme
Module Coordinator: Ruijter van Steveninck, E.D. de

Module Sheet

Module Name IWRM as a tool for adaptation to climate change	Module Code ES11X	Credits 5

Target Group	Prerequisites
Programme target group (Participants in the programmes at IHE) and qualified short course participants.	Programme prerequisites (BSc in a topic appropriate to UNESCO-IHE programme) and basic knowledge of water management.

Learning Objectives

Upon completion of the module participants will be able to..

- describe the expected impacts of climate change on water resources and water use sectors in relation to (other) human activities
- identify the consequences of the predicted impacts of climate change and climate variability for integrated water resources management
- integrate climatic change conditions at different time and spatial scales into (risk) management in the water sector
- justify decisions on adaption to the impacts of climate change under uncertainty

Topics and Learning Activities

Principles of Integrated Water Resources Management
Introduction into the concept of IWRM
Learning Activities:
Lecture and discussion

Climate change and impacts
The climate system and the causes of climate change and variability. Impacts of climate change on the hydrological cycle, the environment and on water use sectors
Learning Activities:
Lectures and exercises

Vulnerability and adaptation under uncertainty
What determines vulnerability to CC. Adaptation measures and strategies how to adapt under a high level of uncertainty
Learning Activities:
Lecture, exercise and fieldtrip

Institutional aspects and stakeholder participation
The importance of involving stakeholders in water management and CC adaptation and strategies on involving stakeholders
Learning Activities:
Lecture,exercise and role play

Multi sector/multicriteria decision making
Modelling effects of CC on water resources using Climateland as a case study
Learning Activities:
Lecture and computer/modelling exercise

Lecturing Material

- Lecture notes, power point presentations, background materials

Assessment

- **30%: Presentation --**
- **70%: Written exam (closed book) --**

2013/2015-ES11X: IWRM as a tool for adaptation to climate change											
Nr	Course/Topic	Lecture	Assignment	Workshop Case study Role play Exercise Lab session	Laboratory work	Fieldtrip - Fieldwork	Design exercise	SUM: contact hours	SUM: studyload hours	Lecturer(s)
1	IWRM, climate change and the hydrological cycle	8						8	24	de Ruyter, van Dorland, Uhlenbrook
2	Â Climate change: impacts and adaptation	14		6				20	48	Â de Ruyter, Pathirana, de Fraiture, Kukuric, Jiang
3	Vulnerability and adaptation under uncertainty	9		7				16	34	Bresser,vdSluis,vdMeulen/Balica,deRuyter
4	Institutional aspects and stakeholder participation			6				6	6	Kemerink
5	Multi sector/multicriteria decision making			20				20	20	Venneker/Wenninger
6	Oral presentations			2				2	2	
7	Field trip					6		6	6	Gersonius, van der Meulen
8	Examination			3				3	3	
	Total	31		44		6		81	143	
MSc module - UNESCO-IHE										

ENVIRONMENTAL SCIENCE

MASTERS PROGRAMME

Academic Year: 2013-2015
Specialization: LWM specialisation
Module Coordinator: Dam, A.A. van

Module Sheet

Module Name Data analysis and modelling for aquatic ecosystems	Module Code ES11L	Credits 5

Target Group
Participants in the Limnology and Wetland Management specialisation of the UNESCO-IHE Environmental Science MSc-programme;
Other UNESCO-IHE participants who select this module as an elective;
Participants who take this module as a short course.

Prerequisites
Programme prerequisites;
Basic course in statistics.

Learning Objectives

Upon completion of the module participants will be able to..

- Store and manipulate experimental data efficiently in a simple database and perform exploratory data analysis using time series plots, scatter plots and descriptive statistics in MS Excel and R;
- Perform basic statistical procedures and analyses using R (distribution tests and transfor-mations, t-tests, ANOVAs, non-parametric tests, simple and multiple regression, etc.)
- Do multivariate statistical analyses, such as multiple regression analysis and factor analysis, using R; and understand the principles of some other advanced modelling applications for ecological data;
- Construct a simple dynamic simulation model of an aquatic ecosystem using Stella;
- Discuss critically the strengths, weaknesses, missing information, advantages and disadvantages of the analyses;
- Communicate effectively the methods, results and conclusions of a case study (presentation and written report).

Topics and Learning Activities

DAMAE Module introduction
Ecological modelling
Multivariate statistics
Advanced topics
Exercises
Case study group work

Lecturing Material

Assessment

• 40%: Written Exam (closed book) -- This is an exam covering all the material presented in the module. It consists of closed questions (Yes/No). At the beginning of week 3 of the module, participants can take this exam as a test which, when passed, gives participant a waiver for the exam.
• 40%: Assignment -- This assignment consists of an individual report on the case study. The participants use the material developed during the exercises in the module and the text written during the writing workshop as building blocks for this individual report. Reports are judged by the module coordinator and (depending on the number of participants) other lecturers according to clear criteria that are provided to the students before the exercise.
• 20%: Presentation -- This is a presentation made by each group about the Stella model developed during the group work in the last week of the module. Presentations are judged by two independent UNESCO-IHE lecturers who were not involved in the rest of the ESA module.

2013/2015-ES11L: Data analysis and modelling for aquatic ecosystems											
Nr	Course/Topic	Lecture	Assignment	Workshop Case study Role play Exercise Lab session	Laboratory work	Fieldtrip - Fieldwork	Design exercise	SUM: contact hours	SUM: studyload hours	Lecturer(s)
	Intro DAMAE module	**1**						**1**	**3**	van Dam
	Ecological modelling	**10**						**10**	**30**	van Dam / Hes
	Multivariate statistics	**4**						**4**	**12**	van Dam / Tran Duy
	Advanced topics	**4**						**4**	**12**	van Dam / guest lecturer
	Exercises data handling				**2**			**2**	**4**	van Dam / Tran Duy
	Exercises basic statistics				**2**			**2**	**4**	van Dam / Tran Duy
	Exercises multivariate statistics				**8**			**8**	**16**	van Dam / Tran Duy
	Exercises ecological modelling				**8**			**8**	**16**	van Dam / Hes
	Intro Case study	**1**						**1**	**3**	van Dam
	Case study conceptual model			**1**				**1**	**1**	van Dam / Hes
	Case study group work			**32**				**32**	**32**	van Dam / Hes
	Case study presentation			**3**				**3**	**3**	Irvine / Gettel / Hes / van Dam
	Test			**2**				**2**	**2**	
	Total	**20**		**38**	**20**			**78**	**138**	
MSc module - UNESCO-IHE										

ENVIRONMENTAL SCIENCE

MASTERS PROGRAMME

Academic Year: 2013-2015
Specialization: Core Programme
Module Coordinator: Hes, E.M.A.

Module Sheet

Module Name Groupwork ES	Module Code ES12TMW	Credits 5

Target Group	Prerequisites
Programme target group	Programme prerequisites

Learning Objectives

Upon completion of the module participants will be able to..

- Solve complex environmental problems by integrating the content of the preceding modules;
- Make decisions on the basis of a limited amount of information;
- Work in a team to solve complex environmental problems

Topics and Learning Activities

Ecoland

The group work consists of a case study in which the techniques and knowledge obtained in the preceding modules are integrated. The group work is located in the fictitious country Ecoland. Ecoland faces enormous environmental problems, which have to be addressed by the participants in their role as consultant or EPA member. During the group work participants have discussion meetings, give presentations and write a report.

Learning Activities:

The group work is carried out as a role-play, in which participants are either belonging to a consultancy or to a local EPA. The participants have group discussions and individual tasks, give progress and final presentations and write a final report.

Lecturing Material

- Handout Ecoland

Assessment

• 100%: Assignment -- The assessment is based on the final report, the oral presentations and the individual contributions.

2013/2015-ES12TMW: Groupwork ES											
Nr	Course/Topic	Lecture	Assignment	Workshop Case study Role play Exercise Lab session	Laboratory work	Fieldtrip - Fieldwork	Design exercise	SUM: contact hours	SUM: studyload hours	Lecturer(s)
	Introduction		2						2	
	Discussions									
	Presentations		16						16	
	Selfstudy, report writing		122						122	
	Total		140						140	
MSc module - UNESCO-IHE										

ENVIRONMENTAL SCIENCE

MASTERS PROGRAMME

Academic Year: 2013-2015
Specialization: Core Programme
Module Coordinator: Hes, E.M.A.

Module Sheet

Module Name Summer courses / research methodology for ES	Module Code ES13	Credits 3

Target Group	Prerequisites
All participants of the programme	The successful completion of at least 8 of the first 11 modules of the programme

Learning Objectives

Upon completion of the module participants will be able to..

- Discuss the latest insights, context and concepts of a contemporary issue of choice
- Able to justify his or her research in the context of UNESCO-IHE research lines, personal professional interests and preferably in local, national and regional contemporary issues.

Topics and Learning Activities

Research methodology

Selected attention to one or several aspects of epistemology, literature review, scientific research methods, statistics, writing for publication, etc.

Learning Activities:

Presentations by and debate between staff, guest lecturers and participants on issues of research methods, epistemology, contemporary issues, etc

Summer courses

Participant will need to select 1 course out of the available Summer Courses on offer during this period (each Masters programme will offer one or more Summer Course open to all participants, as long as prerequisites are met). Topics will be presented as seminars by UNESCO-IHE staff and guest lecturers on specific contemporary themes and issues. Some examples of previous Summer Courses are:

- Water and Climate
- Environmental Flows
- Conflict Resolution
- Flood resilient planning and building

Learning Activities:

Lectures, workshops, assignments

Lecturing Material

- To be announced

Assessment

- **100%: Assignment -- Pass / fail based on attendance to research methodolgy and summer course**

2013/2015-ES13: Summer courses / research methodology for ES											
Nr	**Course/Topic**	**Lecture**	**Assignment**	**Workshop Case study Role play Exercise Lab session**	**Laboratory work**	**Fieldtrip - Fieldwork**	**Design exercise**	**SUM: contact hours**	**SUM: studyload hours**	**Lecturer(s)**
	Research Methodology									Various
	Summer Course									Various
	Total									
MSc module - UNESCO-IHE										

ENVIRONMENTAL SCIENCE

MASTERS PROGRAMME

Academic Year: 2013-2015
Specialization: Core Programme
Module Coordinator: Hes, E.M.A.

Module Sheet

Module Name MSc research proposal development for ES	Module Code ES14	Credits 7

Target Group	Prerequisites
All students of the Environmental Science programme	The successful completion of at least 8 of the first 11 modules

Learning Objectives

Upon completion of the module participants will be able to..

- concisely define the intended research topic, state precise aims and objectives, describe the research methodology, argue expected relevance and justification, and identify boundary conditions and self- or externally imposed limitations;
- list available literature and replicate main arguments expounded in the literature on the specified research topic;
- demonstrate analytical problem-analysis skills and the ability to distil the strategic issues to be addressed in the research phase;
- plan the research process in weekly time-steps and indicate essential milestones, targets and indicators, required human, financial and other resources, deliverables and perceived threats and constraints at each stage of the research project;
- develop and formulate the research proposal in a clearly written, well argued and convincing report, submitted within a set deadline;
- develop and formulate the research proposal in a clearly written, well argued and convincing report, submitted within a set deadline;
  successfully present and defend individual work, cross-reference it to and critically evaluate it in light of contemporary thinking in a specific field of study.

Topics and Learning Activities

Selection of research topic

The initial research topic of study will be selected in a consultative process with a mentor, the MSc coordinator and a professor.

Learning Activities:

Discussion with academic staff members.

Proposal drafting

Research is likely to be based primarily on a review of selected literature, to a limited extent other methods of data gathering and analysis may also be applied (e.g. interviews, laboratory and field work, computer modelling, expert consultations, etc). One hour weekly meetings with the tutor form the main stay of the proposal development process. It is however expected that the MSc candidate will be self-motivated and pro-active, taking all necessary initiatives to reach the set target in a timely fashion.

Learning Activities:

Writing of the proposal

Proposal presentation

The resulting proposal will be presented in written form and orally defended before an audience of critical peers and a panel of staff members.

Learning Activities:

Presentation of the proposal

Lecturing Material

- MSc thesis Protocol
- How to write an MSc thesis – Wendy Sturrock

Assessment

• 100%: Presentation -- The MSc research proposal needs to be approved by the mentor and the professor before the student can actually start the research work.

2013/2015-ES14: MSc research proposal development for ES											
Nr	Course/Topic	Lecture	Assignment	Workshop Case study Role play Exercise Lab session	Laboratory work	Fieldtrip - Fieldwork	Design exercise	SUM: contact hours	SUM: studyload hours	Lecturer(s)
	MSc research proposal drafting		**188**						**188**	
	MSC research proposal presentation				**4**			**4**	**8**	Mentor and professor
	Total		**188**		**4**			**4**	**196**	
MSc module - UNESCO-IHE										

ENVIRONMENTAL SCIENCE

MASTERS PROGRAMME

Academic Year: 2013-2015
Specialization: Core Programme
Module Coordinator: Hes, E.M.A.

Module Sheet

Module Name MSc research	Module Code ES15	Credits 36

Target Group	Prerequisites
Programme target group	Programme prerequisites

Learning Objectives

Upon completion of the module participants will be able to..

- Explore the background of the research problem by critically reviewing scientific literature; Evaluate relevant theories and applying these theories to a relevant scientific problem; Assure adequate delineation and definition of the research topic; Formulate research questions and hypotheses.
- Conduct research, independently or in a multidisciplinary team by selecting and applying appropriate research methodologies and techniques, collecting and analysing data.
- Formulate well-founded conclusions and recommendations based on a comprehensive discussion of the results.
- Demonstrate academic attitude and learning skills (including thinking in multidisciplinary dimensions and distinguishing main issues from minor ones), to enhance and keep up-to-date the acquired knowledge and application skills in a largely independent manner.
- Communicate, debate and defend, clearly and systematically, findings and generated insights, and provide rational underpinning of these in oral and written presentations to a variety of audiences.

Topics and Learning Activities

Lecturing Material

Assessment

• 100%: Assignment -- The MSc work is assessed based on the written report, the final presentation, the defense

2013/2015-ES15: MSc research										
Nr	Course/Topic	Lecture	Assignment	Workshop Case study Role play Exercise Lab session	Laboratory work	Fieldtrip - Fieldwork	Design exercise	SUM: contact hours	SUM: studyload hours	Lecturer(s)
	MSc Research		1008						1008	
	Total		1008						1008	
MSc module - UNESCO-IHE										