

Handbook WM 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 Certain modules or parts of modules may be changed, withdrawn and/or replaced by other modules.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.

Table of Contents

[1 UNESCO-IHE](#)

[1.1 Introduction](#)

[1.2 MSc Degree Programmes](#)

[1.3 Research and PhD Programmes](#)

[1.4 Organisation](#)

[2 Programme framework](#)

[2.1 Introduction](#)

[2.2 Academic Regulations](#)

[2.3 Structure of the Programmes](#)

[2.4 Curriculum Information](#)

[2.5 Learning Objectives](#)

[2.6 Working Methods](#)

[2.7 Examinations](#)

[2.8 Study Load](#)

[2.9 Planning and Scheduling](#)

[2.10 Participation in coursework and lunch seminars](#)

[2.11 Evaluation of the Programme by Students](#)

[3 Regulations](#)

[3.1 Exam regulations](#)

[3.2 Library regulations](#)

[3.3 Code of conduct](#)

[3.4 Plagiarism](#)

[4 WM Programme](#)

[4.1 Intro to WM Programme](#)

[4.2 Final Qualifications WM Programme](#)

[4.3 Specializations](#)

[4.4 Water Resources Management](#)

[4.5 Water Quality Management](#)

[4.6 Water Services Management](#)

[4.7 Water Conflict Management](#)

[4.8 Academic Staff](#)

[5 Facilities](#)

[5.1 Location](#)

[5.2 Student Affairs \(office\)](#)

[5.3 Student Association Board](#)

[5.4 ICT services](#)

[5.5 General Facilities in the Building](#)

[5.6 UNESCO-IHE Library and Information Services](#)

[5.7 Laboratories](#)

[5.8 Study Materials](#)

[5.9 English support courses](#)

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.

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 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. he 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 The 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 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://discc.tees.ac.uk/Plagiarism/Plag-4.htm>

ANNEX 1

TO WHOM IT MAY CONCERN

NAME STUDENT:

.....

STUDENT NUMBER :

.....

Own work declaration

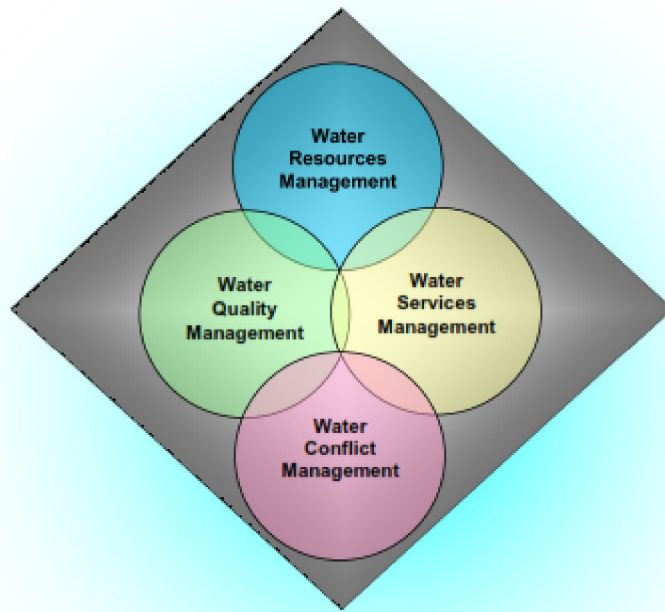
I confirm that all the work I shall submit during my study for assignments, reports and my master thesis shall be my own except where indicated, and that:

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:



INTERNATIONAL MASTER'S PROGRAMME IN

Water Management

Handbook 2013 - 2015

Coordinator WRM Specialization - Yong Jiang
Coordinator WSM Specialization - Maria Pascual
Coordinator WCM Specialization - Zaki Shubber
Coordinator WQM Specialization - Peter Kelderman
MSc Research Coordinator - Maria Rusca

Disclaimer:

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.

4.1 Intro to WM Programme

The International Masters program in Water Management (WM) builds on the recognition that:

- *Water plays a key role in the natural and human environment.*
- *Decisions by water resource planners and developers can have far reaching consequences for society and the environment.*
- *Efficiency, equity and ecological integrity of natural resources use can only be achieved through an integrated approach involving engineering, law, policies, institutional development and management.*

WM covers an interdisciplinary field that combines an understanding of water availability in terms of quality and quantity and hence of key biophysical and hydrological processes with a critical understanding of legal, institutional, economic and other arrangements that regulate access, allocation, treatment, use and discharge of water. The programme aims at imparting to students the knowledge, insight and skills that are required to develop, implement and evaluate water management policies and strategies in order to promote the wise use of water and achieve effective governance of water resources, and to be appropriate candidates for further study towards a research career.

Management implies policy development, planning and design of strategies for sustainable development, allocation of scarce resources, implementation of strategies, and the operation of agencies and utilities. The management approach requires an understanding of problems, causes and an integrated approach to dealing with such problems. Consequently, the objectives of the programme in Water Management consist of three types of aspects:

1. *technical aspects that enhance the understanding of physical, biological and other technical processes;*
2. *non-technical aspects that enhance the understanding of legal, social, economic, financial, institutional and managerial aspects; and*
3. *integrative aspects that enhance the understanding of the interplay between technical and non-technical aspects.*

As such the WM programme responds to the concepts of integrated management for sustainable use of resources, as emphasised by the 1992 International Conference on Water and Environment in Dublin and the 1992 Earth Summit in Rio and affirmed by the 2000 World Water Forum in the Hague, the 2002 Johannesburg declaration and the 2003 World Summit on Water in Kyoto.

The WM programme exposes students to an academic level of thinking and to new developments in the field of study and prepares them to conduct academic research. Furthermore, the approach of UNESCO-IHE is case and solution oriented with an important focus on 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 water and environmental management. 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 sometimes seen as a luxury, the WM programme, with specialisations in Water Resources Management (WRM), Water Quality Management (WQM), Water Conflict Management (WCM) and Water Services Management (WSM), provides approaches and knowledge that are relevant to these challenging conditions.

In water management 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 are ongoing. In addition to increasing accessibility to academic programme elements for interested individuals and professional groups on an ad hoc basis, UNESCO-IHE has introduced a modular structure to stimulate participation by professionals who cannot follow the full-time programme. A module is a three-week concentration of courses around a specific theme and generally opens to external participants. Short-term participants may thus accumulate credits towards the UNESCO-IHE Master's Degree.

Structure of WM Programme

Water Management is one of four UNESCO-IHE Master's programmes. It is offered as an 18-month Master's of Science (MSc) programme. The first year of the programme are taught modules and is followed by a six-month research period resulting in a thesis. The first year starts with four general modules followed by four modules in three specialisations and another three common modules. One of the specialisations is also carried by another IHE programme: Water Quality Management by the Environmental Science (ES) programme. Participants of the ES programmes will follow the common introductory and concluding modules within their own programme, but combine with the **WM** participants in the **WQM** specialisation.

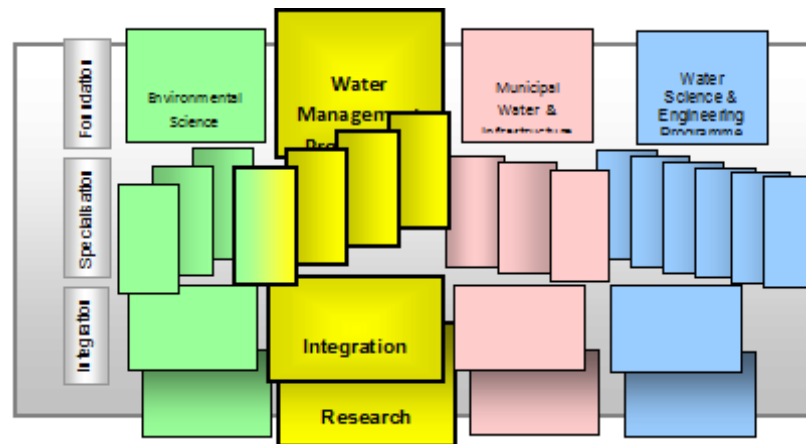


Figure 1 Sharing Specialisations between UNESCO-IHE Master's Programmes

The programme follows a modular structure – each module having duration of three weeks – and consists of three distinct phases:

- 1. Foundation** : a common basis at the start of the programme, where candidates of the WRM, WQM, WCM and WSM specialisations follow four common modules.
- 2. Specialisation** : four modules in four different specialisations, allowing the participants to broaden, but especially deepen their understanding of specific management issues and learn to apply the necessary tools with regard to water resources, conflict, quality and services management. In addition, participants can select two elective modules, either to further deepen or further broaden their knowledge and skills.
- 3. Integration** : participants of the three specialisations come together to test the knowledge, insight and skills acquired in the preceding modules in a multi-disciplinary, problem-solving environment, consisting of a two-week international field trip, facing contemporary water management issues in Europe and a four-week group work seeking management solutions for a simulated river basin in a development context. The **WM** programme culminates in a research proposal development & summer courses period followed by a 6-month research period, dedicated to integrating and applying individual knowledge through applied research in a field directly pertaining to the participant's professional experience, interest and context, integrated with the existing UNESCO-IHE research lines.

The modular structure of the programme allows for sharing of selected modules between specialisations. To a limited extent participants will be allowed to take a module offered under another specialisation or even another programme. However, if a module has not been designated as an elective subject, this will be possible only after prior consultation with and approval of the programme coordinator.

4.2 Final Qualifications WM Programme

Knowledge & understanding

1. Knowledge of current theory and contemporary developments in Water Management.
2. The ability to describe the rationale for an integrated and interdisciplinary approach for managing water systems.
3. Knowledge of biological, physical and chemical principles of water systems.
4. Knowledge of economic, institutional and legal principles, approaches and instruments in water management.
5. Understanding the broader scientific, engineering and socio-economic context and the role of other disciplines required for Water Management.

Applying knowledge and understanding

6. The ability to apply the knowledge and academic capabilities acquired, in management and engineering contexts.
7. The ability to contribute to managing water systems and organisations and to the development of institutional arrangements.
8. The ability to collect, analyse and organise relevant information and to draw sound conclusions.
9. The ability to prepare and implement a scientific research plan.
10. The ability to contribute to theoretical, methodological or applied developments within the field of study.

Making judgements

11. The ability to decide between different ideas and approaches independently, based on available information, and assesses the potential for application, integration and further development.
12. The ability to select and apply a variety of techniques, tools and procedures in order to evaluate the consequences of different development and intervention scenarios.
13. The ability to reflect critically on how different activities impact on the wise use of water.

Communication

14. The ability to report and communicate results clearly, and to explain and defend the reasoning, knowledge and assumptions to a variety of audiences.
15. The ability to function effectively in a multi-disciplinary team.
16. The capability to assess interests among different stakeholders and to facilitate decision-making processes.

Learning skills

17. The ability to extend and enhance one's own knowledge, insight and skills in a largely autonomous manner.

4.3 Specializations

Specialization

The Water Management Programme has four Specializations consisting of four modules each to allow participants to deepen their understanding of specific management issues and learn to apply the necessary tools relevant for their Specialization. In addition, participants can choose two elective modules from a wide range of topics to further deepen and/or broaden their knowledge and skills.

The following Specializations are offered within the Water Management Programme:

- Water Resources Management (WRM)
- Water Services Management (WSM)
- Water Conflict Management (WCM)
- Water Quality Management (WQM)

For more information on the content of each specific Specialization and its learning objectives, please consult the next sections.

4.4 Water Resources Management

The Water Resources Management specialisation studies the ways in which water availability and use are matched, and develops alternative land use and water allocation policies and models and legal and institutional arrangements from the local watersheds to the basin scale and beyond.

The specialisation starts with the module *Negotiation and Mediation for Water Conflict Management I* which addresses the issues potential for conflict and for cooperation when sharing water resources. And, the module *Water Systems Modelling*, which provides a broad introduction to the basics of hydrological, hydraulic and systems modelling; acquiring an understanding of operational concepts through transparent spreadsheet models, the participant develops an intuitive ability to interact with more advanced modelling approaches. Tested and innovative approaches for effective water resources planning, strategy formulation, economic theory and impact assessment and multi-criteria evaluation of management options at the national and international river basin level provide the learning environment in the module *Water Resources Planning*.

The module *Water and Environmental Law* allows participants to place water and environmental resources management in a policy, law and institutional context. Even in a conducive external law and institutional environment, management is unlikely to be successful unless the participant is able to embed them in a functional organisational framework.

The participants can then choose between *Managing Water Organisations* and *Advanced Water Systems Modelling*. The module *Managing Water Organisations* will provide participants keen insight into what makes and keeps an organisation and its managers effective in addressing changing demands on its services. *Advanced Water System Modelling* introduces optimisation tools and catchment balances based on remote sensing and GIS.

Concluding the specialisation, the participant selects the module *Watershed and River Basin Management* or the module *Public-Private Partnerships (PPP)*. *Watershed and River Basin Management* allows the participant the opportunity to assess land and water resources in their natural and anthropogenic interactions at the detailed watershed level, but without losing sight of the potential effects on the larger river basin scale. *PPP* provides a good understanding of arguments and practices of contemporary institutional arrangements in the water services sector and their implications on regulation, labour and economics.

The learning objectives of the WRM specialization are as follows:

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.

4.5 Water Quality Management

The Water Quality Management specialisation studies the water quality impacts of human activities on aquatic ecosystems, as well as alternative remedial actions, under different levels of environmental stress and in different socio-economic contexts. The specialisation starts with the module *Water Quality Assessment*, in which the participant re-acquaints her-/himself with common and critical water pollution parameters, their indicators, sources, causes and effects. Appropriate monitoring, modelling and risk assessment techniques are demonstrated, discussed, applied in case study and simulated settings.

The elective module *Wetlands for Water Quality* combines the use of electronic learning and video-conferencing with hands-on field visits, guest lectures and seminars. The participant realises that in addition to wetlands conservation and safeguarding biodiversity, wetlands have all the ingredients to play a potentially crucial role in wastewater treatment. The third and fourth Water Quality Management specialisation modules are shared with the Water Resources Management specialisation: *Environmental Planning and Implementation*, where the participant will learn to apply sustainable development concepts to policy analysis techniques, as environmental impact assessment and natural resource valuation. And the *Water and Environmental Law* module as described under the previous specialisation.

In the module *Aquatic Ecosystems* the participant is encouraged to grapple with environmental issues related to the use of and impacts on freshwater ecosystems. This module immerses the participant in practical field measurements of a small catchment, combined with laboratory experiments based on samples taken, GIS and computer modelling. Concluding the specialisation, the participant selects either the module *Watershed and River Basin Management* or the module *Public-Private Partnerships* (described above).

The the learning objectives of the WQM specialization are as follows:

Knowledge and theory

1. Be able to 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. Be able to 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. Be able to explain the key concepts for integrated, multi-disciplinary and interdisciplinary analyses of aquatic ecosystems and describe the challenges of such approaches.
4. Be able to 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. Be able to interpret, design and optimize water quality assessment and monitoring programmes by applying experimental, statistical and modelling tools.
6. Be able to 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. 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 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. Be able to 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. 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.

4.6 Water Services Management

The Water Services Management specialisation studies the provision of water and sanitation services and the management of related infrastructure, and designs new institutional and financial instruments and business models for different socio-economic contexts.

Technical and engineering options, standards and developments are unearthed in the module *Water Supply and Sanitation Systems*.

The participant matches water supply and sanitation technology to a wide range of local conditions to ensure sustainable performance and technical reliability. In the second module of the specialisation, *Institutional Analysis*, the participant confirms the primary and supporting objectives and activities for service delivery.

The participants re-think sectoral and organisational vision, mission, goals and objectives and evaluate business processes in light of suitable institutional arrangements.

The module *Financial Management in the Water Sector* allows the participant to demythologise the finance issue at the level of the utility and suggests different ways of financing water companies and cost-recovery for sanitation and wastewater treatment.

The module *Managing Water Organisations* will provide WSM participants profound understanding into what makes and keeps an organisation and its managers effective in addressing changing demands on its services.

Concluding the specialisation, the participant selects a module in line with her or his professional interests from *Watershed and River Basin Management* or *Public-Private Partnerships* (described above).

The learning objectives of the WSM specialization are as follows:

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.

4.7 Water Conflict Management

Water Conflict Management studies the management of conflicts over water resources. It focuses on negotiation, mediation and decision-making processes, in order to prevent, manage and resolve conflicts concerning water. The specialisation starts with the module Negotiation and Mediation for Water Conflict Management I which addresses the issues potential for conflict and for cooperation when sharing water resources. During the second module, Negotiation and Mediation for Water Conflict Management II, the participant will be able to design and facilitate inclusive consultation, negotiation, mediation and decision-making processes between various water users, water managers, politicians and other decision makers. Tested and innovative approaches for effective water resources planning, strategy formulation, economic theory and impact assessment and multi-criteria evaluation of management options at the national and international river basin level provide the learning environment in the module Water Resources Planning.

The content of the Water and Environmental Law module is described earlier. Part of the WCM participants will go to Dundee for modules on International Law of Water Resources, National Water Law and Regulation and Governance in Public and Private Services Provision.

The participants remaining in Delft will follow Managing Water Organisations and choose between Watershed and River Basin Management or Public Private Partnerships (all described above).

The learning objectives of the WCM specialization are as follows:

Knowledge & theory

1. Be able to 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. Be able to 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. Be able to 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. Be able to 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. Be able to design and facilitate inclusive consultation and conflict management processes, such as consensus building, public participation, negotiation and mediation between actors at different levels.
6. Be able to 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. Be able to do 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, 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. Be able to 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. 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.

4.8 Academic Staff

Programme committee

Prof. P. van der Zaag, PhD; Chair, Head WRM Specialization

J. Kemerink, MSc; Secretary, Programme Coordinator

M. Rusca, PhD; Member, MSc Research coordinator

Prof. M.P. van Dijk, PhD; Member, Head WSM Specialization

Prof. J. Gupta, PhD; Member, Head WCM Specialization

Prof. K. Irvine, PhD; Member, Head WQM Specialization

Y. Jiang, PhD; Member, Coordinator WRM

M. Pascual, MSc; Member, Coordinator WSM

Z. Shubber, LL.M; Member, Coordinator WCM

S.J. van Andel, PhD; Member representative WSE

J.H. Koster, MSc; Senior Education Advisor

Module coordinators

WM1 J. Evers

WM2 H. Smit

WM3 M. Rusca & J. Kemerink

WM4 Y. Jiang

WRM5 Y. Mohamed

WCM5 Z. Shubber

WQM5 P. Kelderman

WSM5 S. Seyoum

WRM6 S. Graas

WSM6 M. Blokland

WQM6 H. van Bruggen

WCM6 Z. Shubber

WRM7 I. Masih

WQM7 M. Hamdard

WSM7 Y. Jiang

WM8 F. Jaspers

WM9 K. Schwartz & N. van Couwenberg

WQM10 G.M. Gettel

WSM10 M. Pascual

WRM10 J. Kemerink & H. Smit

WQM11 Y. Jiang

WSM11 M. Kooy

WM12 K. Schwartz

WM13 & WM15 M. Rusca

Academic Staff in Water Management Programme

M.W. Blokland, Associate Professor of Water Services Management

J.J.A. van Bruggen, Senior Lecturer in Microbiology

R.A.M. de Bruijn, Head of Financial Department

J.P. Buiteman, Senior Lecturer in Sanitary Engineering

R.W. Camies, Producer Video and Multimedia

A. Crosato, Senior Lecturer in River Morphology and River Engineering

A.A. van Dam, Senior Lecturer in Ecological & Environmental Modelling

L.P. Darvis, Librarian

M.P. van Dijk, Professor of Water Services Management

W.J.A.M. Douven, Senior Lecturer Environmental Systems Analysis

S. Graas, Senior Lecturer in Water Systems Modelling

A.B.K. van Griensven, Lecturer in Environmental Hydroinformatics

J. Gupta, Professor of Policy Law of Water Resources and Environment

G. Gettel, Lecturer in Aquatic Biogeochemistry

E.M.A. Hes, Lecturer in Environmental Science

M. Hamdard, Lecturer in Environmental Planning and Management

J.C. Heun, Associate Professor of Water Resources Management

H. Helbron, Lecturer in Environmental Planning and Management

M. Hofstra, Senior Advisor Policy Analysis and Water Governance

F.G.W. Jaspers, Associate Professor in Water Resources Management

Y. Jiang, Lecturer in Water Economics

P. Kelderman, Senior Lecturer in Environmental Chemistry

J.S. Kemerink, Lecturer in Water Governance

M. Kooy, Lecturer in Water Governance

F. Kruis, Head of Environmental Laboratory

J. Leentvaar, Professor Environmental Policy Making

P. Libaudière, Lecturer in Water Economics

S. Maskey, Senior Lecturer in Hydrology

Y. Mohamed, Senior Lecturer in Water Resources Management

S. Mugisha, Lecturer in Water Services Management

M.L. Mul, Senior Lecturer in Water Resources Management

J.C. Nonner, Associate Professor of Geohydrology

I.P. Popescu, Senior Lecturer in Hydroinformatics

M. Rusca , Lecturer in Water Governance

M. Ronteltap, Lecturer in Water Supply

E. de Ruyter, Senior Lecturer Aquatic and Marine Ecology

L. Salame, Lecturer in Water Conflict Management

K.H. Schwartz, Senior Lecturer Institutional Development

S.K. Sharma, Senior Lecturer in Water Supply

Z. Shubber, Lecturer in Water Conflict Management

A. Szöllösi-Nagy, Rector UNESCO-IHE Institute for Water Education

W.J. Sturrock, Lecturer in English Communication Skills

S. Uhlenbrook, Professor of Hydrology

N. van Cauwenbergh, Lecturer in Water Resources Management

P. van der Zaag, Professor in Integrated Water Resources Management

J. Wenninger, Senior Lecturer in Hydrology

Guest Lecturers in Water Management Programme

Ph. Barret GEYSER Association

W.G.M. Bastiaanssen, PhD Professor ITC

R. Beltman ICSB

M. Bijlsma Private consultant

A. Bolding, PhD Wageningen University

G. van Boven, MSc Netherlands Commission for Environmental assessment (MER)

R. Brouwer VU Amsterdam

F. Cleaver, PhD University of Bradford

P. Droogers, PhD Future Water

E. Harlé SUEZ

P. Hellegers Wageningen University

S. Hendry Dundee University

A.Y. Hoekstra, PhD Professor Twente University

A. Janssen HKV Consultants

F. Kansiime, PhD Makerere University

G.J. Klaassen Private consultant

K. Komives ISS

J. Kowarsky Israeli Centre for Negotiation and Mediation

H.A.M. de Kruijf, PhD Eco Assistance

A. Kolhoff, MSc Netherlands Commission for Environmental assessment (MER)

W. van der Krogt Deltares

J. Kuylenstierna UN Water

J. Labre SUEZ

P. Meerts Netherlands Institute of International Relations 'Clingendael'

E. Mostert Delft University of Technology

E. Meijers Deltares

T. Perianu SUEZ

J. Pokorny, PhD ENKI Trebon

E. Rap, PhD Wageningen University

H.H.G. Savenije, PhD Professor TU Delft

B. Schijf, MSc Netherlands Commission for Environmental assessment (MER)

A. Schuurmans PSO

F. Smits Waternet, research and engineering

A. Tilmant, PhD Professor Laval University

J.M. Trondalen Compass and UNESCO-PCCP

T. Van Heijzen Vitens

N. Veldkamp WMD

J. Vera Delgado, MSc Wageningen University

M. Vis, PhD Delft Hydraulics

J. Vymazal, PhD ENKI Trebo

A. Wolf Oregon State University

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												2015																																
	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	31	07	14	21	28	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	05	12	19	26	03	10	17	24	31	07	14	21	28	04	11	18	25	02	09	16	23	30	07	14	21	28	05	12	19	26			
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	06	13	20	27	03	10	17	24	31	07	14	21	28	04	11	18	25	03	10	17	24	31	07	14	21	28	05	12	19	26			
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	04	11	18	25	02	09	16	23	30	07	14	21	28	05	12	19
	Module 1			Module 2			Module 3			Module 4			Module 5			Module 6			Module 7			Module 8			Module 9			Module 10			Module 11			Module 12			Module 13			Module 14																	
	(2x5 ECTS)			(2x5 ECTS)			(2x5 ECTS)			(2x5 ECTS)			(2x5 ECTS)			(2x5 ECTS)			(2x5 ECTS)			(1x5 ECTS)			(2x5 ECTS)			(2x5 ECTS)			(1x5 ECTS)			(2x5 ECTS)			(2x5 ECTS)																				

YEAR 2	2014												2015														
	October			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	29	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
- Ascension: 29 May 2014
- Pentecost: 8/9 June 2014
- Christmas: 25/26 Dec 2014
- Good Friday: 3 April 2015
- Easter: 5/6 April 2015



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

Table of Contents

1	General Information.....	2
2	Academic Admission Requirements.....	5
3	Content of the Programme.....	5
4	Examinations.....	5
5	Results of Examinations.....	8
6	Thesis Examinations.....	9
7	Examination Board.....	10
8	Appeals.....	13
9	Final Articles.....	13
Appendix A	Qualifications of Graduates.....	15
	Municipal Water and Infrastructure Programme.....	15
	Environmental Science Programme.....	18
	Water Management Programme.....	27
	Water Science and Engineering Programme.....	31
Appendix B	Eligible Bachelor’s Degrees for Academic admission.....	39
Appendix C	Examination Procedures.....	40
Appendix D	GRADING SYSTEMS used by partner institutes.....	43
Appendix E	MSc module assessment methods.....	48
Appendix F	MSc thesis marking guidelines.....	57

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:
- Municipal Water and Infrastructure
 - Environmental Science
 - Water Management
 - 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 (<i>Wet op Hoger Onderwijs en Wetenschappelijk Onderzoek</i>);
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: <i>tentamen</i>);
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: <ul style="list-style-type: none">• 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: <i>examen</i>);
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:	<ul style="list-style-type: none"> - 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 Ljubljana, 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 distribution processes 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) = $\frac{\text{sum [credits x mark]}}{\text{sum of all credits}}$

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 given 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/11b	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
<i>Course work Semester I</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%)
<i>Course work Semester II:</i>			
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 Sriwijajja 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% Assignments/ 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	<i>Option A:</i> • River flood modelling and 1D flood routing <i>Option B:</i> • 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
2 nd 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 unrealistic.	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 research questions.	Results reported well and with clarity. Some minor lapses in summary of findings. Shows ability to address methodological shortcomings	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 least 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 interpretation.

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.

Water Management Programme Overview 2013-2015

	WQM Water Quality Management	WRM Water Resources Management	WCM Water Conflict Management	WSM Water Services Management	ALL
1	Week one introduction (ALL) <small>.....-20/10 21/10-27/11</small>				
2	Principles of integrated water resources management (WM01) <small>28/10-03/11 04/11-10/11</small>				
3	The Water resources system (WM02) <small>11/11-17/11 18/11-24/11 25/11-01/12</small>				
..	Examination week <small>03/12-09/12</small>				
4	Water governance (WM03) <small>09/12-15/12 16/12-22/12</small>				
..	Free period <small>23/12-29/12 30/12-05/01</small>				
3	<i>(WM03) continue.</i> <small>06/01-12/01</small>				
4	Water economics (WM04) <small>13/01-19/01 20/01-26/01 27/01-02/02</small>				
..	Examination week <small>03/02-09/02</small>				
5	Water quality assessment (=> ES05W)	Water resources assessment (WRM05)	Mediation for water conflict management (WCM05)	Water supply and sanitation systems (WSM05)	
6	Wetlands for water quality (=> ES06W) or Environmental engineering (=> ES06T)	Water systems modelling (WRM06)	Advanced mediation for water conflict management (WCM06)	Managing water organisations (WSM06)	
..	Examination week <small>24/03-30/03</small>				
7	Environmental planning and implementation (=> ES07MW)	Water resources planning (WRM07)		Financial management in the water sector (WSM07)	Research methods WM13a
8	Water and environmental law (WM08) <small>21/04-27/04 28/04-04/05 05/05-11/05</small>				
..	Examination week <small>12/05-18/05</small>				
9	International fieldwork (WM09) <small>19/05-25/05 26/05-01/06 02/06-08/06</small>				
10	Aquatic ecosystems: processes and applications (=> ES10TWL)	Institutional analysis (WRM10)		Partnerships in the water sector (WSM10)	
Click HERE TO CHOOSE YOUR MODULE 10+11 (2013-2015)					
11	Watershed and river basin management (=> ES11MW)	IWRM as a tool for adaptation to climate change (=> ES11X)	Urban water governance (under revision) (WSM11)		
..	Examination week <small>21/07-27/07</small>				
..	Free <small>28/07-03/08</small>				
12	IWRM Groupwork (WM12) <small>04/08-10/08 11/08-17/08 18/08-24/08</small>				
..	Examination week <small>25/08-31/08</small>				
13A	Research methodology for social sciences (WM13a) <small>01/09-07/09</small>				
13B	Capita selecta (WM13b) <small>08/09-14/09 15/09-21/09</small>				
14	MSc thesis proposal (WM14+15) <small>22/09-28/09 29/09-05/10 06/10-12/10</small>				
..	Examination week <small>13/10-19/10</small>				
15	MSc thesis period (6 months) (WM14+15) <small>20/10/14 12/04/15</small>				
..	Final examination week(s) <small>13/04-19/04 20/04-26/04</small>				

Table of Contents

2013/2015-WM01: Week 1 + principles of integrated water resources management	3
2013/2015-WM02: The water resources system	5
2013/2015-WM03: Water governance	7
2013/2015-WM04: Water economics	9
2013/2015-ES05W: Water quality assessment	11
2013/2015-WRM05: Water resources assessment	13
2013/2015-WCM05: Mediation for water conflict management	15
2013/2015-WSM05: Water supply and sanitation systems	18
2013/2015-ES06W: Wetlands for water quality	20
2013/2015-ES06T: Environmental engineering	22
2013/2015-WRM06: Water systems modelling	24
2013/2015-WCM06: Advanced mediation for water conflict management	26
2013/2015-WSM06: Managing water organisations	29
2013/2015-ES07MW: Environmental planning and implementation	31
2013/2015-WRM07: Water resources planning	33
2013/2015-WSM07: Financial management in the water sector	35
2013/2015-ES10TWL: Aquatic ecosystems: processes and applications	37
2013/2015-WRM10: Institutional analysis	39
2013/2015-WSM10: Partnerships in the Water Sector	41
2013/2015-ES11MW: Watershed and river basin management	43
2013/2015-ES11X: IWRM as a tool for adaptation to climate change	45
2013/2015-WSM11: Urban water governance	47
2013/2015-WM12: IWRM Groupwork	49
2013/2015-WM13a: Research and academic skills development WM	51
2013/2015-WM13b: Capita selecta (summer courses)	53
2013/2015-WM14+15: MSc thesis research and thesis writing	54

WATER MANAGEMENT

MASTERS PROGRAMME

Academic Year: 2013-2015
 Specialization: Core Programme
 Module Coordinator: Evers, J.G.

Module Sheet

Module Name		Module Code	Credits
Week 1 + principles of integrated water resources management		WM01	5
Target Group Young and mid-career professionals, engineers and (mid-level) decision makers interested in a basic and broad understanding of main issues in the water management context.		Prerequisites Preferably a relevant water science or management related BSc degree; some experience in the water sector; good command of the English language (reading, writing, speaking).	

Learning Objectives

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

- Summarize the latest insights, context and concepts in integrated water management that are under debate in international and regional forums.
- Explain the main arguments for an integrated approach in the field of water management.
- Describe the major natural functions and human uses of river systems.
- Summarize the basics of GIS and Remote Sensing, and apply the techniques for typical applications in water management.
- Explain what science is and what scientific research entails including distinguishing the main methodological approaches.

Topics and Learning Activities

Introduction to the Module

Integrated Water Resources Management

Context, developments, perspectives, issues and debates in Integrated Water Resources Management. Water Resources: green water vs. blue water; catchment yield. Water Demand: demand projections; demand management; elasticity of water demand; the value of water. Water allocation. Water governance.

Introduction to GIS and Remote Sensing

Basics of GIS and Remote Sensing. Vector-based geographic data processing with Arc-View GIS. GIS analysis and visualization. Grid data analysis and overlays including DEM and hydrological applications. Supervised and un-supervised classification.

Research and Academic Skills Development

What is Science?; Different Approaches to Scientific Methodology; Referencing; Plagiarism; Critical Reading.

Lecturing Material

- Water Resources Management, UNESCO-IHE Lecture Notes.
- Introduction to GIS and RS, Reader on GIS. UNESCO-IHE Lecture Notes.
- Other handouts and relevant articles.

Assessment

- 50%: Written Exam (closed book) --
- 25%: Assignment -- GIS Assignment
- 25%: Assignment -- Annotated Bibliography Assignment

2013/2015-WM01: Week 1 + principles of integrated water resources management

Nr	Course/Topic	Lecture	Assignment	Workshop Case study Role play Exercise Lab session	Laboratory work	Fieldtrip - Fieldwork	Design exercise	SUM: contact hours	SUM: study/load hours	Lecturer(s)
1	Principles of IWRM									
1.1	Water Resources	4						4	12	Van der Zaag
1.2	Water Demand	4						4	12	Van der Zaag
1.3	Water Allocation	4						4	12	Van der Zaag
1.4	Water Governance	4						4	12	Van der Zaag
1.5	Emerging Issues	4						4	12	Van der Zaag
	GIS & Remote Sensing									
2	Introduction GIS	2						2	6	Smit
2.1	Vector data analysis			4				4	4	Smit
2.2	Raster data analysis			4				4	4	Smit
2.3	Image data analysis			4				4	4	Smit
2.4	Remote sensing			4				4	4	Smit
2.5	Application of GIS and Remote Sensing to WM		4						4	Smit
3	Philosophy of Science									
3.1	What is Science?	4						4	12	Irvine
3.2	Different Approaches to Scientific Methodology	4						4	12	Wehn de Montalvo
3.3	Critical reading				4			4	8	Wehn de Montalvo
3.4	Referencing & Plagiarism			4				4	4	Darvis
3.5	Annotated Bibliography assignment		15						15	
	Exam		3						3	
	Total	30	22	20	4			54	140	
MSc module - UNESCO-IHE										

WATER MANAGEMENT

MASTERS PROGRAMME

Academic Year: 2013-2015
 Specialization: Core Programme
 Module Coordinator: Smit, H.

Module Sheet

Module Name The water resources system		Module Code WM02	Credits 5
Target Group Young and mid-career professionals, engineers and (mid-level) decision makers interested in understanding the bio-physical system as a sound basis for water management.	Prerequisites Preferably a relevant water science or management related BSc degree; some experience in the water sector; good command of the English language. Basic knowledge of integrated water resources management and MS Excel are essential.		

Learning Objectives

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

- Describe how the physical water resources system works, and illustrate the interaction between quantity and quality (chemical, biological, ecological), between surface water, soil water and groundwater, between stocks and fluxes. Explain major natural functions and human use of water resources systems focusing on river systems including groundwater, wetlands, lakes/reservoirs and estuaries.
- Identify basic components to characterise the quantitative and qualitative nature of a water resources system and able to analyse the hydrology of a water resources systems.
- Discuss the main issues of debate in an integrated water resources system underpinned by description of the biophysical, chemical and hydrological processes and their interactions, natural functions and human use of a water resources system.

Topics and Learning Activities

Water Resources System:

Basic concepts in defining a water resources system, systems approach in water resources management, functions of the water resources systems, characteristics of the natural resources system, introduction to rivers, lakes and reservoirs, wetlands and estuaries as distinct as well as integrated (or interdependent) water resources systems. Understanding of natural system processes and interactions including the biophysical, hydrological, ecological and water quality processes and their interactions along with their natural functions, human uses and major problems.

Learning Activities:

The learning activities include lectures and exercises.

The lectures are accompanied by PowerPoint presentations, available to the participants for self study.

Hydrology of Water Resources Systems:

Hydrological cycle and water balance. Precipitation and evaporation. Principles of hydrology of surface and groundwater systems, hydrology of lakes and reservoirs including introduction to reservoir water balance and operations. Workshop on Hydrology: Analysis of hydro-climatic data (e.g. precipitation, river flows), discharge rating curve and reservoir operation.

Learning Activities:

The learning activities include lectures, workshops, and exercises.

The lectures are accompanied by PowerPoint presentations, available to the participants for self study. Special effort is geared towards quantitative analysis of water resources systems.

Water Quality:

Basics on water chemistry; chemical reactions; acids, bases, buffers in natural waters; precipitation and dissolution; redox reactions in the environment. Photosynthesis. Water quality issues related to aquatic ecosystems including eutrophication.

Learning Activities:

The learning activities include lectures, workshops, exercises and laboratory work.

The lectures are accompanied by PowerPoint presentations.

Lecturing Material

- D. P. Loucks, E. van Beek, J. R. Stedinger, J. P. M. Dijkman, and M. T. Villars. 2005. Water Resources Systems Planning and Management: An Introduction to Methods, Models and Applications. UNESCO Publishing, Paris.
- Loucks, D., and E. van Beek (2005), Water resources systems planning and management, UNESCO Publishing, Paris, France. (Selected annex- A and E)

- P.J.M. de Laat, Y.A. Mohamed. M.L. Mul, and J.W. Wenninger. 2010. Hydrology: An introductory course. UNESCO-IHE Lecture Notes.

- Y. Mohamed, P.J.M. de Laat, and L. Kewzi. Workshop Hydrology. 2010. UNESCO-IHE Lecture Notes.
- J.C. Nonner. 2006. Introduction to Hydrogeology. UNESCO-IHE Lecture Notes Series. Taylor and Francis, Leiden.
- Water Chemistry and Biology, Kelderman. UNESCO-IHE Lecture Notes.
- Lectures-Power point presentations.
- Pre-Lecture material on Basics of Chemistry, Kelderman, UNESCO-IHE lecture notes.

Assessment

- **65%: Written Exam (closed book) --**
- **35%: Assignment -- This includes assignments and workshops**

2013/2015-WM02: The water resources system										
Nr	Course/Topic	Lecture	Assignment	Workshop Case study Role play Exercise Lab session	Laboratory work	Fieldtrip - Fieldwork	Design exercise	SUM: contact hours	SUM: study/load hours	Lecturer(s)
1	Water Resources System									
1.1	Introduction to module	1						1	3	H.Smit
1.2	Introduction to Water Resources System	3						3	9	H.Smit
1.3	River Systems	4						4	12	K. Irvine
1.4	Lakes, wetlands and estuaries	4						4	12	K. Irvine
2	Hydrology of Water Resources System									
2.1	Concepts of hydrology, hydrological cycle, water balance	2		2				4	8	Y. Mohamed and H. Smit
2.2	Precipitation	2		4				6	10	Y. Mohamed and H. Smit
2.3	Evaporation and Transpiration	2		4				6	10	Y. Mohamed and H. Smit
2.4	Surface water resources	2				2		4	12	Y. Mohamed and H. Smit
2.5	Groundwater resources	4		2				6	14	Y. Zhou
2.6	Reservoir water balance and operation	2						2	6	Y. Mohamed
3	Water Quality									
3.1	Water Chemistry	4		4				8	16	P. Kelderman
3.2	Aquatic ecosystem and water quality issues	6						6	18	P. Kelderman
3.3	Laboratory session			4				4	4	F. Kruis
4	Exam			3				3	3	
	Total	36		23			2	61	137	
MSc module - UNESCO-IHE										

WATER MANAGEMENT

MASTERS PROGRAMME

Academic Year: 2013-2015
 Specialization: Core Programme
 Module Coordinator: Kemerink, J.S.

Module Sheet

Module Name Water governance	Module Code WM03	Credits 5
Target Group Young mid-career professionals who are 1) working at middle and upper 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.	Prerequisites Preferably a relevant bachelors degree or equivalent; good English command to read and discuss academic articles; willingness to engage in social science theory and new conceptual frameworks.	

Learning Objectives

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

- Identify and analyse actors and decision making processes related to water governance
- Distinguish and explain main discourses and theories on water governance
- Identify context, purpose, perspective and arguments of scientific papers on water governance
- Compare and contrast different scientific papers, case studies and theories on dynamic and political nature of water governance

Topics and Learning Activities

Introduction to water governance

Discussing and analysing various definitions on water governance.
 Analysing concepts related to water governance (e.g institutions, policies, organizations).
 Discussing different modes of governance and analysing shifts in governance.
 Deconstructing the notion on 'good governance'.

Learning Activities:

Lectures, tutorials, debate, self-study

Politics of Water Governance

Defining politics and analyzing the political nature of water governance processes.
 Identifying actors in decision-making processes and discussing the concept of participation.
 Discussing and analysing water governance processes at three political levels:
 Everyday politics, Politics of policy & Global politics.

Learning Activities:

Lectures, case studies, tutorials, debate, film, self-study

Research methodology

Critical reading of scientific articles

Learning Activities:

Lectures, workshop, exercise

Lecturing Material

- Scientific articles
- Books
- Power Point Presentations

Assessment

- **50%: Written Exam (open book) --**
- **20%: Assignment --** Within this group assignment the students will critically analyze scientific articles and identify and describe the context, purpose, perspective and arguments given by the authors. This will be presented in class followed by a plenary discussion on the articles.
- **30%: Assignment --** Within this individual assignment the students will critically analyze and deconstruct shifts in governance and present their findings in an essay. Students can choose to select a particular country and study the shifts within the water resources or water services over time (e.g. 50 years) or they can opt for analyzing a particular shift (e.g. private sector involvement, introduction of water permit system) in-depth.

2013/2015-WM03: Water governance

Nr	Course/Topic	Lecture	Assignment	Workshop Case study Role play Exercise Lab session	Laboratory work	Fieldtrip - Fieldwork	Design exercise	SUM: contact hours	SUM: study/load hours	Lecturer(s)
1	Concepts of Water Governance									
1.1	Introduction to the Module	1						1	3	Kemerink & Rusca
1.2	Social-Nature	4						4	12	Kooy
1.3	Water governance: an introduction	4						4	12	Rusca
1.4	Debate: Good Governance?			2				2	2	Rusca & Kemerink
1.5	Shifts in Governance	4						4	12	Kemerink & Schwartz
1.6	Research methodology	4		2				6	14	Evers
2	Politics of Governance									
2.1	Politics: an introduction	4						4	12	Rusca
2.2	Concept of participation	2		2				4	8	Kemerink
2.3	Everyday politics	2						2	6	Kemerink & Guest lecture
2.5	Politics of policy: promotion of policy models	2						2	6	Rap
2.6	Global politics	4						4	12	Ahlers/Rusca
2.7	Film: Life and Debt			1				1	1	Rusca
3	Tutorials			10				10	10	Several
4	Assignment		30						30	
5	Exam		3						3	
Total		31	33	17				48	143	
MSc module - UNESCO-IHE										

WATER MANAGEMENT

MASTERS PROGRAMME

Academic Year: 2013-2015
 Specialization: Core Programme
 Module Coordinator: Jiang, Y.

Module Sheet

Module Name Water economics		Module Code WM04	Credits 5
Target Group Young and mid-career professionals, engineers and (mid-level) decision makers interested in water (resources) economics.		Prerequisites Preferably a relevant water science or management related BSc degree; Some experience in the water sector; Good command of the English language.	

Learning Objectives

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

- Describe the principles of economics and the relevance of economics to water management
- Explain the cause of water resource issues using economic theory and concepts
- Identify economic instruments for water resource management
- Describe economic approaches to estimating the value of water in different use
- Apply economic theory and method to analyze issues of water resource management

Topics and Learning Activities

1. Introduction to water economics

This section provides an overview of the water economics module, introduces water economics by addressing why economics is relevant to water management, uses simple examples and/or case studies to highlight the role and potential of economics to improve water management under emerging water crisis while stimulating interests and economic thinking.

Learning Activities:

Lecture, group exercise/workshop

2. Economic foundation of water resource management

This section lays economic foundation for water management, covering (relevant) economic theory and method, and economic perspective on the cause and characteristics of water issues.

Learning Activities:

Lecture, group exercise/workshop

3. Economic approaches to water resource management

This section synthesizes economic approaches to managing water, including price and quantity based policy instruments such as water pricing and tradable water rights, comparing incentive-based approach with command and control, institutional role, and benefit-cost analysis for water-related decision making.

Learning Activities:

Lecture, group exercise/workshop

4. The economic value of water

This section explains the economic value of water and relevance to water management, introduces different approaches to valuing water in different use, and presents a case study valuing water.

Learning Activities:

Lecture, group exercise/workshop

Lecturing Material

- Lecture notes by Prof. M.P. van Dijk and Dr. Y. Jiang
- Economics in the SWITCH-project. M.P. van Dijk. Unpublished paper.
- Water Resource Economics: The Analysis of Scarcity, Policies, and Projects. Griffin, R. C. (2006). MIT Press, Cambridge, MA, USA.
- Principles of Economics (6th edition). Mankiw, N.G. (2012). South-Western Gengage Learning, United Kingdom.
- Environmental & Natural Resource Economics (9th edition). Tietenberg, T., Lewis, L. (2012). Pearson, Amsterdam, the Netherlands.

Assessment

- 30%: Assignment --
- 70%: Written exam (closed book) --

2013/2015-WM04: Water economics										
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 water economics	2						2	6	Jiang
2	Economic foundations of water (resources) management									Jiang
2.1	Principles of economics and economist role	4						4	12	
2.2	Demand and supply	2		2				4	8	
2.4	Welfare economics and economic efficiency	4						4	12	
2.5	The issue of water resources: an economic perspective	4						4	12	
3	Economic approaches to water (resources) management									van Dijk/Guest Lecturer
3.1	Tradable water rights and water markets	2						2	6	
3.2	Water pricing	2						2	6	
3.3	Market-based approach v.s. command and control	2						2	6	
3.4	Economics in water management: Different Perspectives	2						2	6	
3.5	Quantitative research methodology	4		2				6	14	
4	The economic value of water									Guest Lecturer/Jiang
4.1	The economic value of water and decision making	2						2	6	
4.2	Economic approaches to valuing water and practical issues	4						4	12	
5	Ravilla roleplay			22				22	22	
6	Individual assignment		13						13	
7	Exam		3						3	
Total		34	16	26				60	144	
MSc module - UNESCO-IHE										

ENVIRONMENTAL SCIENCE

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 Young and mid-career professionals (scientists, consultants, decision makers) with a background in Water management or Environmental science.	Prerequisites 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 successful 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										

WATER MANAGEMENT

MASTERS PROGRAMME

Academic Year: 2013-2015
 Specialization: Water Management
 Module Coordinator: Mohamed, Y.A.

Module Sheet

Module Name Water resources assessment		Module Code WRM05	Credits 5
Target Group Young and mid-career professionals, managers, engineers and technicians interested in water resources management in general, and in particular the assessment of quantity and quality of water resources. Processing and validation of both ground and remote sensing data is a key part of the module.	Prerequisites Successful completion of WM1, WM2 or equivalent is strongly recommended. Affinity with quantitative approaches is required. Good command of English.		

Learning Objectives

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

- Describe different types of water resources data, generated from ground and RS measurements.
- Apply diverse methods of data processing and data validation for water resources assessment.
- Quantify the different components of the water resources spectrum (rainfall, river flow, groundwater), and assess availability and access at different scales.
- Describe and apply different methods of water quality monitoring and assessment.
- Analyse and quantify multiple uses of water for: agriculture, hydropower, domestic, environment and other uses
- Apply water accounting techniques as a quick method for assessing water resources, water use, and water productivity in a river basin context.

Topics and Learning Activities

Water resources assessment

- Water Resources data: Different types of water resources data, monitoring, validation, archiving, and dissemination.
- Surface water resources assessment: time series analysis of WR data, including: flow duration curves, statistical distribution and trend analysis, extreme value analysis (floods and droughts).
- Groundwater resources assessment: Defining sustainable yield, occurrence of groundwater and investigation methods, methods of groundwater abstraction.
- Water quality monitoring and assessment: requirements for WQ assessment; WQ parameters; WQ monitoring program; Pollution; WQ assessment.
- Estimation of water resources data in un-gauged basins and regionalization.

Learning Activities:

The learning activities include lectures and workshops in class, exercises and tutorial, and a field visit to the "Water Management Centre, The Netherlands", Lelystad.

Water using activities

Agricultural water demand, crop water requirement, net irrigation requirement, yield analysis, domestic water use, hydropower water demand, environmental water requirement.

Learning Activities:

The learning activities include lectures and workshops in class, as well as exercises.

Water accounting

Introduction to remote sensing data for water resources management; Satellite image processing; Catchment water balance in GIS environment; Water productivity and water valuation; Water accounting.

Learning Activities:

The learning activities include lectures and workshops in class, as well as exercises.

Lecturing Material

- Guide to Hydrological Practices: Volume I - Hydrology "From Measurement to Hydrological Information, WMO No 168, 2008.
- Water Resources Assessment Hand Book for review of national capabilities, 1997 (WMO, UNESCO)
- Water accounting at river basin scale, Mohamed, 2013. UNESCO-IHE lecture notes.
- Introduction to Hydrogeology, Johannes C. Nonner, 2012, Taylor and Francis/CRC Press/Balkema
- Molden, D., 1997. Accounting for Water Use and Productivity, SWIM Paper 1, International Irrigation Management Institute, 1 Colombo, Sri Lanka.
- Lectures-Power point presentations

Assessment

• 65%: Written Exam (closed book) -- GW resources assessment 10%; WQ assessment 15%; Water using activities 15%; Water accounting 25%

• 35%: Assignment -- Surface Water Resources Assessment 15%; GW resources assessment 5%; Water accounting 15%

2013/2015-WRM05: Water resources 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	Introduction to WRA	2						2	6	Mohamed
2	Water Resources Assessment									
2.1	Water resources data (case study)	2		2				4	8	Masih
2.2	Surface water resources assessment	4		4				8	16	Mohamed
2.3	Groundwater resources assessment	4		4				8	16	Nonner
2.4	Water quality assessment	6						6	18	Kelderman
2.6	WRA in un-gauged basins	2		2				4	8	Masih
3	Water use activities	4			2			6	16	Graas
4	Water accounting									Mohamed/Bastiaanssen
4.1	GIS/RS applications in WRA	2		2				4	8	
4.2	Processing of spatial data (Land use, precipitation, evapotranspiration, runoff)	2		2	2			6	12	
4.3	Computation of catchment water balance	2		2	2			6	12	
4.4	Water accounting at different scales	2		2	2			6	12	
5	Field visit WaterNet					4		4	4	
6	Exam					3		3	3	
	Total	32		20	8	7		67	139	
MSc module - UNESCO-IHE										

WATER MANAGEMENT

MASTERS PROGRAMME

Academic Year: 2013-2015
 Specialization: Core Programme
 Module Coordinator: Shubber, Z.S.

Module Sheet

Module Name Mediation for water conflict management		Module Code WCM05	Credits 5
Target Group Current and future water managers, decision-makers and others involved in water management wanting to broaden their scope in water management. Professionals involved in dispute resolution wanting to broaden the scope of their activities to include water. Students need to have a first degree in a relevant subject (economics, social sciences, law, engineering, biology etc.) and preferably several years of relevant working experience.	Prerequisites Knowledge and appreciation of the principles of integrated water resources management, the water resources system and water governance.		

Learning Objectives

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

- Explain, discuss and analyze the basic concepts of conflict management and conflicts related to water.
- Discuss and analyze, from a conflict and cooperation perspective, cases of water sharing and use among different actors at different levels and from different sectors.
- Discuss, analyze and understand the impact of human activities on water systems and the repercussion on water conflict and cooperation.
- Identify, explain and analyze the elements of a negotiation process applied to the management of a water conflict.
- Prepare, organize, engage in negotiation processes related to shared water resources with different stakeholders.
- Apply a set of skills and tools required for water conflict management through a negotiation process.

Topics and Learning Activities

Introduction to theoretical concepts and frameworks of conflict

A one day lecture will provide the basic theoretical background to understand the concepts and frameworks that apply to conflict.

Learning Activities:

Lecture and interactive discussions.

Alternative dispute resolution approaches

The spectrum of alternative dispute resolution approaches, focusing on negotiation techniques and styles, are presented during a two day lecture. The various components of a negotiation process (trust, interests, alternatives, options, criteria & standards, communication, relationship, agreement) will be studied and key skills for successful conflict resolution (active listening, open ended questions, identification of positions and interests, the use of standards).

Learning Activities:

Exercises and a role play will be used to help the participants practice the skills they learn.

International Negotiation Processes

International negotiation processes, multilateral negotiations between ten parties, debrief of multilateral negotiations, minilateral bargaining on a water problem, cultural aspects and personal behavior in negotiation.

Learning Activities:

Managing international negotiation processes on water issues is a vital skill for those who have to represent and defend the interests of their organization. Knowing how to go from A to B in a cooperative process is as important as being a specialist on water issues and other dossiers. This four day lecture intends to confront the theory and practice of bargaining, help students to get a better understanding in handling procedures/processes & people/parties & positions/products, while not forgetting about power/perception and some other factors in negotiation such as, for example, the context in which negotiations are undertaken. On the first day, the phenomenon of negotiation will be defined, while bilateral negotiation will be practiced. On the second day strategy and tactics will be dealt with. Various aspects related to the behavior of a negotiator (skills, styles and cultural aspects) will also be covered. On the third day, multilateral negotiations will be studied. Role plays will be organized and will be concluded on the fourth day. A single text on disaster relief issues will be drafted and debriefed. The objective of this exercise will be for the students to get as close to reality as possible. By using

Clingendael's Workbook, students will be provided with exercises and negotiation literature. Participants will have to be aware of the fact that there will be some homework for day two and three, handed out on day one.

Negotiation strategies and confidence-building measures

Development of negotiation strategy, lessons learned (common errors, etc.), and confidence building measures.

Learning Activities:

This lecture aims to provide a more in-depth understanding of prevention and of resolution of international water disputes - as well as of the role participants could play in such processes. The following aspects will be dealt with: various types of water conflicts; common errors and success-factors in negotiations; preparing for negotiations; conducting a 'reality' negotiation role-play (with post-assessment; the notion of adaptive negotiator, including how to make right decisions under pressure; the development of a negotiation strategy; confidence building initiatives, and some specific lesson learned.

Cases of transboundary water conflicts or cooperation

Presentation of in-depth case studies on transboundary water conflicts or cooperation.

Learning Activities:

Relevant in-depth case studies will be presented by experts and discussed in class.

Final role play

In this role play participants simulate a conflict on an transboundary water body.

Learning Activities:

Participants simulate a conflict on an transboundary water body. The participants will be assigned roles in the delegations of different stakeholders concerned with the management of this water body (governments, NGO representatives, professional networks, local governments, etc). Different negotiation rounds will be simulated. Feedback will be provided during and at the end by teachers and participants themselves.

Annotated bibliography

The students will develop an annotated bibliography on a topic of their choice and submit it at the end of the module. The annotated bibliography can be a stepping stone for the Essay assignment of the WCM II module.

Lecturing Material

- Alternative Dispute Resolution, a focus on a negotiation technique; by Ms. Lena Salame.
- Workbook of International Negotiation; The Clingendael Institute.
- Sourcebook Enhanced Negotiation Skills, Dispute Resolution of International Water Resources; J.M. Trondalen.
- Getting to Yes; R. Fisher and W. Ury (Random House, London, 1991).

Assessment

- **40%: Written Exam (closed book) --**
- **20%: Skills assessment -- Skills assessment with two measurements - at start of module and at end of module**
- **40%: Assignment -- Annotated bibliography**

2013/2015-WCM05: Mediation for water conflict management

Nr	Course/Topic	Lecture	Assignment	Workshop Case study Role play Exercise Lab session	Laboratory work	Fieldtrip - Fieldwork	Design exercise	SUM:		Lecturer(s)
								contact hours	study/load hours	
1	Introduction			2				2	2	Salame & van der Zaag
2	Alternative dispute resolution approaches	6		8				14	26	Salame
3	International negotiation processes	6		22				28	40	Perlot & Meerts
4	Introduction to conflict theory	6		2				8	20	To be announced
5	Negotiation strategies and confidence-building measures	5		13				18	28	To be announced
6	Cases of transboundary water conflicts or cooperation			2				2	2	Szollosi-Nagy
7	Final role play			6				6	6	Salame
8	Annotated bibliography		16						16	Salame
	Exam		3						3	
	Total	23	19	55				78	143	

MSc module - UNESCO-IHE

WATER MANAGEMENT

MASTERS PROGRAMME

Academic Year: 2013-2015
Specialization: WM - WSM
Module Coordinator: Seyoum, S.D.

Module Sheet

Module Name Water supply and sanitation systems		Module Code WSM05	Credits 5
Target Group Mid-career professionals dealing with planning and management aspects of water supply and sanitation infrastructure, working for municipalities, ministries, water and sewerage agencies or consulting firms.	Prerequisites Preferably a relevant water science or engineering related bachelor's degree or equivalent and some relevant experience.		

Learning Objectives

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

- Discuss and provide a general overview of the technical and engineering aspects of water supply and sanitation infrastructure.
- Describe different types of water supply and sanitation systems and their suitability of application under different conditions
- Discuss treatment processes, structural components, function and performance of water supply and sanitation systems
- Discuss and apply the technical/design aspects of system level planning and operation and maintenance of the associated facilities.

Topics and Learning Activities

Introduction to water supply and sanitation systems

Learning Activities:

Lectures

Water treatment

Learning Activities:

Lectures, Design Assignment

Water transport and distribution

Learning Activities:

Lectures, workshop

Ecological Sanitation

Learning Activities:

Lectures, workshop

Sewerage and drainage systems

Learning Activities:

Lectures, assignment

Wastewater treatment processes and plants

Learning Activities:

Lectures, assignment, field visit

Lecturing Material

- Power point presentations.
- Field visits.

Assessment

- 70%: Written Exam (closed book) --
- 30%: Assignment --

2013/2015-WSM05: Water supply and sanitation systems

Nr	Course/Topic	Lecture	Assignment	Workshop Case study Role play Exercise Lab session	Laboratory work	Fieldtrip - Fieldwork	Design exercise	SUM:		Lecturer(s)
								contact hours	study/load hours	
1	Introduction to water supply and sanitation systems	1						1	3	Seyoum
2	Raw water and drinking water aspects	4						4	12	Buiteman
3	Conventional water treatment methods	6	4					6	22	Buiteman
4	Raw water abstraction, pre-treatment and storage	2						2	6	Buiteman
5	Water treatment processes and plants	4	4				4	8	28	Buiteman
6	Water transport and distribution	4		4				8	16	Trifunovic
7	Ecological Sanitation	4		2				6	14	Ronteltap
8	Sewerage and drainage systems	4		4				8	16	Pathirana
9	Wastewater treatment processes and plants	4		4				8	16	Carlos Lopez Vazquez
10	Water and wastewater treatment plant visit					8		8	8	Seyoum
11	Exam									
Total		33	8	14		8	4	59	141	
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 Wetlands for water quality		Module Code ES06W	Credits 5
Target Group Programme target group	Prerequisites 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:		Lecturer(s)
								contact hours	study/load hours	
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: Core Programme
Module Coordinator: Raj, E.R.

Module Sheet

Module Name Environmental engineering		Module Code ES06T	Credits 5
Target Group Programme target group	Prerequisites 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: study/load 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										

WATER MANAGEMENT

MASTERS PROGRAMME

Academic Year: 2013-2015
 Specialization: Water Resources Management
 Module Coordinator: Graas, S.

Module Sheet

Module Name Water systems modelling		Module Code WRM06	Credits 5
Target Group Young and mid-career professionals, managers, engineers and technicians dealing with or interested in various aspects of water resources modelling.		Prerequisites Affinity with quantitative approaches is required. Good command of English.	

Learning Objectives

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

- Describe the procedure of the modelling protocol.
- Name and explain type of models used in different case studies.
- Build water resources models that simulate river basin processes.
- Clearly present the results of the water system models.
- Critically analyse model outcomes.

Topics and Learning Activities

Water system modelling - Concepts

Introduction to water system modelling concepts, including procedure in the modelling protocol, different types of models (prescriptive vs descriptive, stochastic vs conceptual, lumped vs distributed), calibration and validation procedures, performance indicators and available software packages.

Learning Activities:

Lectures supported by ppt and book chapters.

Water system modelling - Practice

Application of 3 different models. A hydrological model (HBV); a water allocation model (Waflex) and a hydraulic model (Mike-11) will be build and tested after which the output will be analysed and interpreted. The developed models will increase the understanding of the participants in the possible applications of water system modelling within the concept of integrated river basin management. One of the models has to be chosen to be presented and critically discussed during an oral exam.

Learning Activities:

Interactive computer workshops.

Paper discussion

Read two journal articles on the topic (selected by the lecturers) which are discussed during a session. The discussion will focus on the relevance of the modelling theory applied to the article in question, to appreciate the advantages of modelling for water resources management and to be able to understand, analyse and interpret model results.

Learning Activities:

Discussion.

Fieldtrip

A relevant organisation will be visited where the use of quantative data, monitoring and models for their work will be illustrated.

Learning Activities:

Excursion.

Case studies

Several guest lecturers will come and share their experience with respect to modelling water systems.

Learning Activities:

Lectures supported by ppt (and hand-outs).

Lecturing Material

- Loucks, D.P. and Van Beek, E. 2005. Water Resources Systems Planning and Management, UNESCO-publishing. To be studied: Chapter 2,3,9 and 11.
- Mul, M.L. – Spreadsheet modelling, UNESCO-IHE Lecture Notes.
- Other handouts: Selected background reading.
- Software applications: HBV, WAFLEX (MS Excel), MIKE 11, DUFLOW.

Assessment

- 60%: Written Exam (open book) --
- 40%: Presentation --

2013/2015-WRM06: Water systems 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 system modelling - Concepts									
1.1	Why model	2						2	6	Graas
1.2	Modelling process	4						4	12	Graas
1.3	Calibration and Uncertainty analysis	2						2	6	Masih
1.4	Types of models	2						2	6	Masih
1.5	Examples of Software Packages for Water Systems Modelling	2						2	6	Popescu
1.6	Explanation assignment and Q&A session		2						2	Graas, Masih, Popescu
2	River Basin Simulations - Practice									
2.1	HBV (rainfall-runoff)				10			10	20	Masih
2.2	Waflex (water allocation)				12			12	24	Graas
2.3	Mike 11 (flood)				12			12	24	Popescu
3	Paper discussion	4						4	12	Graas, Masih
4	Field trip					8		8	8	Graas, Smits
5	Case studies									
5.1	Land use modelling & optimisation			4				4	4	Yong
5.2	New data sources for modelling			4				4	4	Alfonso
6	Exam		3						3	
	Total	16	5	8	34	8		66	137	
MSc module - UNESCO-IHE										

WATER MANAGEMENT

MASTERS PROGRAMME

Academic Year: 2013-2015
 Specialization: Water Conflict Management
 Module Coordinator: Shubber, Z.S.

Module Sheet

Module Name Advanced mediation for water conflict management		Module Code WCM06	Credits 5
Target Group Current and future water managers, decision-makers and others involved in water management wanting to broaden their scope in water management. Professionals involved in dispute resolution wanting to broaden the scope of their activities to include water. Students need to have a first degree in a relevant subject (economics, social sciences, law, engineering, biology etc.) and preferably several years of relevant working experience.	Prerequisites Knowledge and appreciation of the principles of integrated water resources management, the water resources system and water governance.		

Learning Objectives

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

- Critically analyze cases of water sharing and use among different actors at different levels and from different sectors, from a conflict and cooperation perspective.
- Identify pertinent cooperative frameworks that apply to specific conflict situations and assess their efficiency.
- Apply management skills in conflict transformation, strategic planning, and water governance.
- Explain and discuss the advantages of mediation processes, and prepare, organize and engage in them as a party and as a mediator for the resolution of shared water disputes.
- Explain, discuss and assess other consultation and cooperative processes (e.g. consensus building, public participation), and be able to prepare, organize and engage in them.

Topics and Learning Activities

Introduction

This module focuses on various processes of conflict resolution. It teaches the students how to design and manage a mediation process as well as other processes that can be used in transboundary water management. It ends with a role play in which the students design and manage the processes they were taught, using the skills they have acquired. The module also presents relevant case studies. Students are also required to write an essay on a relevant topic.

Learning Activities:

During the first half of the day, the module, its structure and objectives will be introduced to the students.

The expectations of the students will be collected and discussed.

The profiles of the various trainers and visiting lecturers will be presented.

Mediation techniques applied to water issues

Environmental and water conflicts often involve more than two parties and are multi-layered in content, therefore it is crucial to suit the process to the conflict at hand (Negotiation, Mediation, Public participation, Facilitation, Consensus Building, or any combination thereof). Mediation is among the processes, well suited for two or more parties and multi-issues, which are involved in environmental and water conflicts when engaging in the attempt to resolve local, regional and international conflicts. It is important that the parties in dispute over water enter the suitable process voluntarily, knowing that if they reach an agreement, they will be accountable for its implementation.

Mediation plays an important role in national and international conflicts.

Learning Activities:

The lecture will focus both on theory of negotiation and mediation and the analytic tools necessary to become a successful negotiator and mediator.

The mediator has to learn to assess the conflict, identify the interests of the parties, identify other stake holders (other countries, international organizations, etc.), write and ratify the written agreement.

Design and implement conflict resolution processes

This lecture provides an opportunity to learn about current and leading-edge ways to work effectively in contentious water situations. It offers a place to practice new skills that are applicable from the individual level to the societal level and across a range of real-life situations.

Successful multi-party negotiations require profound transformations in the way participants conceptualize the

issues at hand. Those involved can often point to the precise moment when thinking altered dramatically - the 'aha!' moment - where emphasis shifted from individuals thinking only in terms of their own agenda to also understanding the needs of the other. Traditional conflict resolution models define these moments in rational terms - 'people come to agreement when it is in their interest to agree.' Even overlooking the tautological nature of this argument, 'rationality' simply often does not hold sway if the conflict involves even a modicum of real emotion.

To really understand the process of transformation, and the settings most conducive to inducing these shifts, then, one may do well to look outside of the field of conflict resolution as defined in modern, academic terms. When one thinks of the situations most analogous to settings conducive to transformative thinking, the world of spiritual transformation rises as potentially the most appropriate. Every spiritual tradition in the world, after all, is devoted to precisely this process of transformation: to aid individuals in moving from a focus on their own immediate wants and desires, to addressing more their obligations to society, humanity, and to the divine.

Learning Activities:

This lecture, then, explores the relationship between political conflict and cooperation, and approaches and techniques from the realm of spiritual transformation, in our case as might be applied in international water resources negotiations.

This lecture will also present cooperative trends in several basins around the world. It will touch upon specific themes (eg. the evolution of the concept of equitable distribution of benefits, or how negotiations tend to evolve from rights to needs to equity), bringing in several cases that the participants are familiar with.

The skills of the students will be evaluated the final role play of this lecture.

Cases of transboundary water conflicts or cooperation

Presentation of case studies on transboundary water conflicts or cooperation.

Learning Activities:

Relevant case studies will be presented by experts and discussed in class.

Final role play

The purposes of the game are to make participants aware of

- o The various aspects (technical, managerial, political) related to the management (transboundary) waters
- o The complexity of applying integrated and participatory approaches in decision making
- o The complexity of managerial, technical and human aspects of negotiations, consensus building, stakeholder participation and dialogue processes in relation to the management of water resources.

Learning Activities:

The actors in the game have personal and confidential instructions outlining their goals and, partly, how they relate to other actors. The instructions also contain strategic information, regarding available means, goals to be achieved, alliances to be created etc. Consensus building is the key and will require strong focus on confidence and relationship building and strategies to deal with conflicting goals. The creativity of each actor to seek innovative solutions will be essential. Debriefing will take place during and immediately after the formal negotiations.

Essay

The students will be required to develop an essay on a topic related to water conflict management based on relevant scientific literature. They will have to submit it after the end of the module. For the students who followed WCM I, the essay can be based on their work for the annotated bibliography.

The essay will have to include the following elements:

introduction of the topic defining a precise problem statement, research question or hypothesis; review presenting the main ideas and issues on the debate, i.e. outlining the different positions or view points and interests at stake; discussion in which they give their own point of view on the topic and relate the topic in question to their own situation and experience; a conclusion; and a reference list and bibliography.

Learning Activities:

To formulate a relevant and well-defined topic for an essay, and a related well-defined objective.

To identify, select, read, process, and analyse relevant research papers and scientific literature on a selected topic.

To write a well-structured and coherent scientific text, and present a summary to fellow students and staff.

Lecturing Material

- Negotiation and Mediation, Theory and Skill. Workbook. The Israel Center for Negotiation and Mediation, Haifa.
- Designing and implementing conflict resolution processes (transformation and spirituality). Lecture Note by Professor Aaron Wolf, Oregon State University.

Assessment

- **40%: Skills assessment -- Skills assessment during one roleplay, which will be pre-announced to the participants.**
- **60%: Assignment -- Essay**

2013/2015-WCM06: Advanced mediation for water conflict management

Nr	Course/Topic	Lecture	Assignment	Workshop Case study Role play Exercise Lab session	Laboratory work	Fieldtrip - Fieldwork	Design exercise	SUM:		Lecturer(s)
								contact hours	study/load hours	
1	Introduction			2				2	2	Salame & van der Zaag
2	Mediation techniques applied to water issues	6		14				20	32	Kowarsky
3	Design and implement conflict resolution processes	12		20				32	56	Wolf
5	Cases of transboundary water conflicts or cooperation			6				6	6	Gupta and others
6	Final roleplay			14				14	14	Bring
	Essay		28						28	Salame & van der Zaag
	Total	18	28	56				74	138	
MSc module - UNESCO-IHE										

WATER MANAGEMENT

MASTERS PROGRAMME

Academic Year: 2013-2015
Specialization: Core Programme
Module Coordinator: Blokland, M.W.

Module Sheet

Module Name Managing water organisations		Module Code WSM06	Credits 5
Target Group Young and mid-career professionals with an interest in strategic and operational management of water organisations.	Prerequisites Preferably experience in the water sector. A bachelor's degree or equivalent. Basic PC-computer knowledge. Good command of English language.		

Learning Objectives

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

- Explain the position and strategy of a water organisation in relation to its institutional environment.
- Summarize the scope, scale, structure and key work processes of organisations
- Analyze the management and decision-making processes in water organisations, including the management of change.
- Plan the use of performance analysis and benchmarking in the regulation and management of water organisations.
- Assess the processes of human resources, health and safety, management for integrity and sustainability, asset management and customer management.

Topics and Learning Activities

Water Organizations in Context

Mandate and structure, scale and scope of operations, ethics, integrity, sustainability, climate change, and reform.

Water Organisations at Work

Environment and strategy, performance and benchmarking, human resources management, health and safety, asset management, customer management.

Lecturing Material

- Reading materials.
- Discussions.
- Exercises.
- Case studies.
- Power-point presentations.
- Two field trips; one to a water supply company and one to a river basin organisation.

Assessment

- 100%: Assignment -- Essay

2013/2015-WSM06: Managing water organisations

Nr	Course/Topic	Lecture	Assignment	Workshop Case study Role play Exercise Lab session	Laboratory work	Fieldtrip - Fieldwork	Design exercise	SUM: contact hours	SUM: study/load hours	Lecturer(s)
1	Introduction									
1.1	Course and Fieldtrip Introductions			2				2	2	Blokland
1.2	Managing a Water Utility			8				8	8	To be announced
2	Water Organisations in Context									
2.1	Organisations Undergoing Reform			6				6	6	Schwartz
2.2	Mandate and Structure of RBOs			6				6	6	Mostert
2.3	Environment and Strategy			6				6	6	Schouten
2.4	Scale and Scope of Operations			8				8	8	Douven
3	Water Organisations at Work									
3.1	Effective Organisations			6				6	6	Schuurmans
3.2	Performance and Benchmarking			10				10	10	Blokland
3.3	Integrity, Sustainability			6				6	6	Mairesse, Fahsi
3.4	Health and Safety			6				6	6	Harle
3.5	Asset Management			8				8	8	van Dijk
3.6	Customer Management			6				6	6	Beltman
3.7	Human Resources Management			6				6	6	van Heijzen
4	Fieldtrip					16		16	16	Waternet Amsterdam & Drinking water utility WMD
5	Assignment		43						43	
	Total		43	84		16		100	143	

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 Young and mid-career professionals (scientists, decision-makers) with a background in environmental management, water management and / or watershed management.	Prerequisites 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: study/load 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

WATER MANAGEMENT

MASTERS PROGRAMME

Academic Year: 2013-2015

Specialization: Water Resources Management and Water Conflict Management

Module Coordinator: Cauwenbergh, N.J.M. van

Module Sheet

Module Name Water resources planning		Module Code WRM07	Credits 5
Target Group Young and mid-career professionals, managers, engineers and technicians who have the ambition to judge, participate in and guide multi-disciplinary water resources planning studies.	Prerequisites Understanding of the water resources physical system. Understanding of water use for agriculture, water supply, hydropower and environment. Understanding of water governance. Computer literacy. Good command of English.		

Learning Objectives

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

- Explain basic concepts and notions in water resources planning.
- Describe major steps in the participatory and integrated water resources planning process.
- Identify and apply tools and models, such as stakeholder integration, environmental impact assessment (EIA), decision support systems, role plays and water system models, while engaging in water resources planning activities.
- Develop alternative water management strategies and compare and evaluate them by applying multi-criteria analysis.
- Discuss water resources planning and implementation in basins for specific context with special attention to basins in a developing country context.

Topics and Learning Activities

Introduction to Water Resources Planning and Framework for Analysis

This block introduces principles of integrated water resources planning and common notions used in planning, planning scales and approaches.

The overall module and links between learning activities and other modules will be explained and case studies used in the module will be introduced.

In a second part, the different steps of a planning process will be discussed.

Comprehension of frameworks used in water resources planning with focus on key steps in the planning process, such as situation and function analysis including multi-level stakeholder and water sector analysis, planning objectives and criteria, scenario and strategy development, evaluation (screening) of alternatives and strategies and participatory multi-criteria analysis. Importance of stakeholder participation in the planning process, opportunities and limitations. Tools and methods for stakeholder participation in key steps of the planning process including participatory decision support systems. Negotiation and compensation in group decision making.

The evolution of and experience with participatory and integrated planning methods will be demonstrated through case study examples.

Learning Activities:

The learning activities include lectures, exercises and assignments, interactive (computer) workshops, use of decision support system (Altaguax DSS).

Methods, models and tools for Water Resources Planning

The second block in the module highlights different approaches, methods, models and tools in water resources planning and environmental planning in general. This block is further divided in 3 main parts.

(1) The role of modelling in Water Resources Planning:

Comprehensive overview of different types of models and when they are used in the planning process. Discussion of experiences, opportunities and limitations of modeling and their design.

(2) LIBRA role play on multi criteria analysis (MCA) of water management alternatives: in this role play participants will play the role of a relevant stakeholder and construct a set of alternatives that will be evaluated using MCA, based on a set of predefined objectives and criteria of the plan.

(3) Environmental Impact Assessment:

Environmental impacts of water resources development projects, principles and methods of environmental impact assessment, environmental impact assessment (EIA) and its application in water resources planning, case study and exercise on impact matrix.

Learning Activities:

The learning activities include lectures, exercises, assignments and role play simulation game using LIBRA model.

Experiences in the water resources planning in the Global South

Plan implementation and evaluation will be discussed based on case studies from the global south.

Case studies and discussion on practices, challenges and opportunities for water resources planning in the global south.

Learning Activities:

The learning activities include lectures and exercises on case studies by lecturers experienced with plan implementation and an integrated assignment with group discussion.

Lecturing Material

- J.C. Heun and N. Van Cauwenbergh, 2012 (updated 2014) "Participatory Integrated Water Resources Planning: Framework for Analysis and Stakeholder integration, UNESCO-IHE Lecture Notes.

- Clouting H., Beevers L. and R. Vis, 2014 - Environmental Impact Assessment for water related projects, UNESCO-IHE Lecture Notes.

- D. P. Loucks, E. van Beek, J. R. Stedinger, J. P. M. Dijkman, and M. T. Villars. 2005. Water Resources Systems Planning and Management: An Introduction to Methods, Models and Applications. UNESCO Publishing, Paris.

- Additional reading:

CapNet and GWP (2005). Integrated Water Resources Management Plans: Training manual and operational guide.

- Additional reading: INBO and GWP (2009), A handbook for IWRM in basins

- Additional reading: GWP toolbox website: <http://www.gwp.org/en/ToolBox/>

- Software: LIBRA River Basin Planning Simulation, Excel Spreadsheets, Altaguax DSS, Expert Choice (MCA).

- Other Handouts: Examples of case studies, Selected background reading.

Assessment

- 60%: Written Exam (closed book) --

- 40%: Assignment -- This includes assignments and exercises

2013/2015-WRM07: Water resources planning										
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 Module and Framework for analysis	10	5	12				22	47	Van Cauwenbergh
2	Models, methods and tools for Water Resources Planning:									
	Use of models in WRP	4						4	12	Masih
	LIBRA role play and MCA			10				10	10	Heun / Masih
3	Environmental Impact Assessment	4	5	8				12	25	Clouting / Vis
4	Experience in water resources planning in the global south-case studies and dis	4	16	12				16	40	van Beek / Douven/ Guest lecture
5	Field Trip					7		7	7	Masih and Hofstra
	Exam		3						3	
	Total	22	29	42		7		71	144	
MSc module - UNESCO-IHE										

WATER MANAGEMENT

MASTERS PROGRAMME

Academic Year: 2013-2015
Specialization: Water Services Management
Module Coordinator: Jiang, Y.

Module Sheet

Module Name Financial management in the water sector		Module Code WSM07	Credits 5
Target Group Staff from water organisations and other related sector institutions, who are interested in financial management of water related enterprises.	Prerequisites Preferably a relevant water science, economics or finance related bachelor degree; Some experience in the water sector; Good command of the English language.		

Learning Objectives

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

- Recognize the need for commercial accounting and identify the components of standard financial statements in water organisations.
- Analyze the financial position of a water organisation through an analysis of financial statements.
- Compute a Social Cost-Benefit Analysis for water and sanitation related projects.
- Apply simple financial and economic modelling to optimize production and improve financial performance.
- Employ demand assessments and discuss the fundamentals of water pricing.
- Recognize and implement basic customer protection and marketing techniques in water organisations.

Topics and Learning Activities

1. Introduction to Financial Management.
2. Finance and accounts management.
3. Financial Analysis and Instruments
4. Cost-Benefit Analysis.
5. Economic and financial modelling techniques.
6. Cost recovery and water tariffs
7. Services and customer protection issues

Lecturing Material

- Lecture notes, Powerpoint presentations.
- Related scientific articles.
- Reference books.

Assessment

- 80%: Written Exam (closed book) --
- 20%: Assignment --

2013/2015-WSM07: Financial management in the water sector

Nr	Course/Topic	Lecture	Assignment	Workshop Case study Role play Exercise Lab session	Laboratory work	Fieldtrip - Fieldwork	Design exercise	SUM:		Lecturer(s)
								contact hours	study/load hours	
1	Introduction to Financial Management	2						2	6	Guest lecturer
2	Finance and accounts management	10		4				14	34	Guest lecturer
3	Demand assessment, water pricing and cost recovery	10		4				14	34	Jiang
4	Cost-Benefit Analysis	4		4				8	16	Jiang/Guest lecturer
5	Sevices marketing and customer protection issues	4						4	12	Guest lecturer
6	Economic and financial modelling techniques	4						4	12	Guest lecturer
7	Financial operations management, group exercise	2	6					2	12	Guest lecturer
	Individual assignment		14						14	
	Exam		3						3	
	Total	36	23	12				48	143	

MSc module - UNESCO-IHE

ENVIRONMENTAL SCIENCE

MASTERS PROGRAMME

Academic Year: 2013-2015
Specialization: Core Programme
Module Coordinator: Gettel, G.M.

Module Sheet

Module Name		Module Code	Credits
Aquatic ecosystems: processes and applications		ES10TWL	5
Target Group Programme target group (Participants in the programmes at IHE) and qualified short course participants	Prerequisites 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: study/load 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 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.		Prerequisites 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 Tennessee Valley Authority, the water user association model, and a case of soil erosion 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 social 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 analysis of institutions visible in a case study. The student is expected 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: study/load 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													

WATER MANAGEMENT

MASTERS PROGRAMME

Academic Year: 2013-2015
Specialization: Core Programme
Module Coordinator: Pascual Sanz, M.

Module Sheet

Module Name Partnerships in the Water Sector		Module Code WSM10	Credits 5
Target Group Professional staff active in water related institutions, such as governmental bodies, NGOs, consultancy firms, research institutions and water utilities. Future professionals, such as promising bachelor students.	Prerequisites Preferably a water science, economics or management related bachelor degree; Experience in the water sector; Good command of the English language.		

Learning Objectives

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

- Recognize different PPP options and principles governing PPPs.
- Estimate the suitability of PPP options, based on lessons learned from past PPP contracts.
- Determine whether the prerequisite enabling environment of a chosen PPP option is present.
- Evaluate the pitfalls in a PPP implementation process, including the procurement cycle.

Topics and Learning Activities

Introduction.

Principles of PPP.

Environment and strategy, performance and benchmarking, human resources management, health and safety, asset management, customer management.

PPP in practice.

Issues regarding PPPs.

Fieldtrip: Harnasch polder; Delfluent Services.

Mini Symposium.

Lecturing Material

- Lecture notes by prof. M. P. van Dijk.
- Scientific articles.
- Powerpoint presentations.
- Marin, P. (2009). Public-Private Partnerships: A review of experiences in developing countries. PPIAF & The World Bank.

Assessment

- 70%: Written Exam (open book) -- Essay
- 30%: Assignment -- Individual assignment

2013/2015-WSM10: Partnerships in the Water Sector

Nr	Course/Topic	Lecture	Assignment	Workshop Case study Role play Exercise Lab session	Laboratory work	Fieldtrip - Fieldwork	Design exercise	SUM: contact hours	SUM: study/load hours	Lecturer(s)
1	Introduction									
1.1	Introduction to the course	1						1	3	Pascual
1.2	Theory on partnerships	2						2	6	Pascual
1.3	Historical evolution of partnerships in the water sector	2						2	6	Schwartz
2	PPPs in the water sector									
2.1	PPP objectives and standard forms	2						2	6	Pascual & Schouten
2.2	PPP cases	4						4	12	Pascual & Schouten
2.3	Tutorials						3	3	9	Pascual & Schouten
3	Partnerships; actors, contracts and results									
3.1	The design of a partnership	2						2	6	Guest lecturer
3.2	Contracts (I)	4						4	12	Guest lecturer
3.3	Contracts (II)	1		4				5	7	Pascual & Schouten
3.4	Evaluation of partnerships	2						2	6	Pascual & Schouten
3.5	Exercises on evaluation of partnerships	1	2	2				3	7	Pascual & Schouten
3.6	Experiences from the field	1		2				3	5	Guest lecturer/s
4	Emerging partnership forms									
4.1	New sources of investment, new actors, new objectives	1						1	3	Pascual
4.2	Water Operator Partnerships: theory and practice	3						3	9	Pascual
4.3	Partnerships for water supply with small scale providers: theory and practice	3						3	9	Schwartz and Rusca
4.4	Partnerships for sanitation	2						2	6	Guest lecturer
	À									
5	Fieldtrip: Harnasch polder / Deffluent services					4		4	4	Pascual
6	Mini Symposium	4						4	12	Pascual & guest lecturer/s
	Individual assignment		12						12	
	Exam		3						3	
	Total	35	17	8	4	3	50	143		
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 Young and mid-career professionals (scientists, decision-makers) with a background in water management, environmental management, and / or watershed management.	Prerequisites Affinity with hydrology, development economics, agronomy or geography (preferably a relevant water science or engineering related bachelor'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 river 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 aquatic 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 activities in watersheds and river basins, covering soil & water management, watershed hydrology and human interventions, environmental flow, and groundwater 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 participatory 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 exercise 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 exercise

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: study/load 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

ENVIRONMENTAL SCIENCE

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 Programme target group (Participants in the programmes at IHE) and qualified short course participants.	Prerequisites 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: study/load hours	Lecturer(s)
1	IWRM, climate change and the hydrological cycle	8						8	24	de Ruyter, van Dorland, Uhlenbrook
2	Climate change: impacts and adaptation	14		6				20	48	À 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										

WATER MANAGEMENT

MASTERS PROGRAMME

Academic Year: 2013-2015
 Specialization: Core Programme
 Module Coordinator: Kooy, M.E.

Module Sheet

Module Name Urban water governance		Module Code WSM11	Credits 5
Target Group Young mid-career professionals who are 1) working at middle and upper level in an organization in the water sector, 2) employed in policy making institutions in the water sector, 3) working for organizations engaged in management of water resources and water services.	Prerequisites Mandatory: High level of ability to read and discuss academic articles and book chapters in English; willingness to engage in social science theory and new conceptual frameworks; willingness to engage in cross-disciplinary discussions and applications. Preferred: completion of the Institutional Analysis module.		

Learning Objectives

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

- Articulate the relevance of current urban development debates for the provision of water supply/sanitation services.
- Identify relationships between urban governance and urban water supply/sanitation infrastructure (be able to describe how they influence and inform each other) in presented case studies.
- Apply the concept of the hydro-social cycle to analyze the intersection of social issues/processes with technical issues in urban water supply and sanitation service delivery.

Topics and Learning Activities

Introduction to urban development in the global South

Trends in urbanization; description of the urbanization process; description of current infrastructure and states of access to basic services in cities of the global South.

Learning Activities:

lecture, assigned reading

Urban development & inequality

Discussion of conditions of urban poverty; description of urban poverty measurements and trends; discussion of urban poverty, inequality and exclusion as related to urban WSS infrastructure.

Learning Activities:

lecture, assigned reading

Urban growth & slum urbanism

Discussion of urban migration; low income urban settlements; peri-urbanization and urban sprawl as related to access to water/sanitation.

Learning Activities:

lecture, assigned reading

Urban resilience

Discussion of the relationship between urbanization and climate change; climate change impacts on cities in the global South; urban resiliency planning.

Learning Activities:

lecture, assigned reading

Right to the City

social movements and urban politics; grassroots urban coalitions

Learning Activities:

lecture, assigned reading

Urban waterscapes & the hydro-social cycle

urban water supply as the inter-section of social and biophysical processes; water as a socio-natural entity

Learning Activities:

lecture, assigned reading

The modern city

Integrated urban infrastructural ideal; hydraulic paradigm and urban planning ideals

Learning Activities:

lecture, assigned reading

Lecturing Material

- Students will be provided a list of articles that are required reading.

Assessment

- **20%: Assignment** -- Students will work in small groups to identify how the current key challenges for urban development, discussed in week 1, relate to access to water supply and sanitation.
- **30%: Assignment** -- Students will read 2-3 journal articles per topic for week 2 and submit short written assignments.
- **50%: Assignment** -- Students will write a final essay to apply the concepts learned in Week 1-2.

2013/2015-WSM11: Urban water governance														
Nr	Course/Topic	Lecture	Assignment	Workshop	Case study	Role play	Exercise	Lab session	Laboratory work	Fieldtrip - Fieldwork	Design exercise	SUM: contact hours	SUM: study/load hours	Lecturer(s)
	Introduction to urban development challenges in the global South	2	4									2	10	Kooy
	Urban poverty & inequality	2	4									2	10	Pouw (UvA)
	Urban growth & slum urbanism	2	4									2	10	Kooy
	Urban resilience	2	4									2	10	Kooy
	Right to the city	2	4									2	10	Rusca
	Urban waterscapes & hydro-social cycle	2	4									2	10	Smit/Kooy
	Modern city	2	4									2	10	Kooy
	The Modern city: case study	2										2	6	guest (March)
	The Splintered city	2	4									2	10	Kooy
	The Splintered city: case study	2										2	6	Kooy
	The Informal city	2	4									2	10	Schwartz/Rusca
	The Informal city: case study	2										2	6	guest
	Essay assignment		30										30	À 0
	Total	24	66									24	138	
MSc module - UNESCO-IHE														

WATER MANAGEMENT

MASTERS PROGRAMME

Academic Year: 2013-2015
Specialization: Core Programme
Module Coordinator: Schwartz, K.H.

Module Sheet

Module Name	Module Code	Credits
IWRM Groupwork	WM12	5
Target Group This module is required for all participants in the Water Management programme. Participants of the WQM specialisation may, however, choose to participate in the group work of the Environmental Science.	Prerequisites Bachelor`s degree. Basic computer skills (MS-Windows, Office) Good English command. Participation in the WM Fieldwork.	

Learning Objectives

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

- Develop a final problem analysis on specific problems of water management in the Andarax Basin.
- Design approaches for mitigating the specific problems in the Andarax Basin.
- Evaluate the different approaches and argue for a preferred approach to mitigate identified problems.
- Integrate different approaches (targeted at different themes/problems) into an integrated water management plan.
- Present and argue for the integrated water management plan.

Topics and Learning Activities

Introduction to the Module

The Groupwork is based on the Andarax basin in southern Spain. As such, the Groupwork is a continuation of the Fieldwork undertaken in June. Information and data collected during the fieldwork forms the basis for the 3-week groupwork. In the introduction session the activities in the module are introduced.

Fine-tune Andarax Problem Analysis

Prior to developing an integrated plan, students finalize and present the problem analysis that was started during the international fieldwork in June.

Options and Multi-criteria Analysis

Based on the problem analyses, the groups will propose possible approaches/solutions to mitigate the identified problems. In addition, the groups present an approach to analyze the different solutions and identify a preferred solution.

Integrated Water Management Report

In this report, an integrated plan will be presented aimed to mitigate the problems identified by the different thematic groups.

Lecturing Material

- Please visit <http://www.altaguax.org/> for relevant literature

Assessment

- 65%: Assignment -- Thematic report based on fieldwork in the Andrarax Basin (during the International Fieldwork).
- 35%: Assignment -- Integrated report on water management plan for the Andarax basin.

2013/2015-WM12: IWRM Groupwork

Nr	Course/Topic	Lecture	Assignment	Workshop Case study Role play Exercise Lab session	Laboratory work	Fieldtrip - Fieldwork	Design exercise	SUM:		Lecturer(s)
								contact hours	study/load hours	
1	Introduction Groupwork	1						1	3	Schwartz and Graas
2	Presentations thematic groups			2				2	2	Various
3	Introduction Integrated Groups	1						1	3	Schwartz and Graas
4	Draft Presentations Integrated Groups			2				2	2	Various
5	Groupwork		126						126	
6	Final Presentations Integrated Groups			4				4	4	Various
	Total	2	126	8				10	140	

MSc module - UNESCO-IHE

WATER MANAGEMENT

MASTERS PROGRAMME

Academic Year: 2013-2015
 Specialization: All WM
 Module Coordinator: Rusca, M.

Module Sheet

Module Name Research and academic skills development WM		Module Code WM13a	Credits 7
Target Group This module is available to all WM participants. It is also open to participants of the WQM specialisations who started under the Environmental Science programme.	Prerequisites The successful completion of at least 8 of the first 11 modules of the Water Management Programme.		

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, using the project management approach, 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
- 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

Research topic delineation, literature review, Problem analysis, Strategy development

- Project plan

The initial research topic of study will be selected in a consultative process with a mentor, the MSc coordinator and a WM professor.

Learning Activities:

Reading, discussing

Proposal development and formulation

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.

Presentation and defence

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 - WM programme
- 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-WM13a: Research and academic skills development WM

Nr	Course/Topic	Lecture	Assignment	Workshop Case study Role play Exercise Lab session	Laboratory work	Fieldtrip - Fieldwork	Design exercise	SUM:		Lecturer(s)
								contact hours	study/load hours	
	Introduction to Research Methodology for the Social Sciences	1						1	3	Schwartz
	Conceptual framework	2						2	6	Rusca
	Introduction to Cluster Meetings			2				2	2	Kemerink
	Interview Techniques and Participant Observation	2						2	6	Kemerink
	Frequently Made Mistakes			3				3	3	Ahlers
	Data Analysis			4				4	4	Schwartz
	Research Exercise		30					30		Ahlers/Schwartz
	Proposal Design	1						1	3	Schwartz
	Case Study Methodology	3						3	9	Schwartz
	Survey Design	4						4	12	Van Dijk
	Survey Analysis	4						4	12	Van Dijk
	Total	17	30	9				26	90	
MSc module - UNESCO-IHE										

WATER MANAGEMENT

MASTERS PROGRAMME

Academic Year: 2013-2015
 Specialization: Core Programme
 Module Coordinator: Kemerink, J.S.

Module Sheet

Module Name Capita selecta (summer courses)		Module Code WM13b	Credits 5
Target Group All participants of the WM programme		Prerequisites	

Learning Objectives

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

- demonstrate a broader scientific view.

Topics and Learning Activities

Capita Selecta

depends of the selection of topics

Lecturing Material

Assessment

- 100%: Assignment --

2013/2015-WM13b: Capita selecta (summer courses)										
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	MSc research proposal drafting									
2	MSC research proposal presentation									Mentor and professor
Total										
MSc module - UNESCO-IHE										

WATER MANAGEMENT

MASTERS PROGRAMME

Academic Year: 2013-2015
 Specialization: Core Programme
 Module Coordinator: Rusca, M.

Module Sheet

Module Name MSc thesis research and thesis writing		Module Code WM14+15	Credits 36
Target Group This module is available to all WM participants.		Prerequisites The successful completion of at least 8 of the first 11 modules of the Water Management Programme.	

Learning Objectives

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

- Conduct 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 and recommendations
- Guarantee scientific integrity and independence in content and process, giving due credit to sources and ideas used
- Apply critical and creative thought processes, using standard as well as innovative
- Argue the applicability, relevance and significance of research results to the field of Integrated Water Resources Management
- Clearly and systematically communicate, argue and defend findings in oral and written presentation to a an audience of critical peers

Topics and Learning Activities

MSc Research

MSc research consists of individual work by the candidate, but may be set within the context of a larger research or project activity. Occasionally, the specific MSc research project can be a combined effort of more than one MSc candidate. The project may be carried out at the UNESCO-IHE facilities, third-party facilities or within the home-country context (the so-called Sandwich construction). Weekly coaching is available from the assigned UNESCO-IHE mentor and monthly contact with the supervising professor is encouraged. Responsibility for initiating these contacts lies with the candidate. Additional on-site third-party coaching is recommended when research is carried out at third-party facilities or in a sandwich construction.

Lecturing Material

Assessment

- **100%: Oral Exam -- Assessment is done by public examination of the MSc Thesis. For this purpose an examination committee will be formed for each MSc candidate.**

2013/2015-WM14+15: MSc thesis research and thesis writing														
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	MSc Research		1008									1008		
	Total		1008									1008		
MSc module - UNESCO-IHE														