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Master Programme in Water Management Handbook 2011-2013

UNESCO-IHE
Institute for Water Education



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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
- Municipal Water and Infrastructure
- 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 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* printed in the preamble of this handbook.

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 4 credit points;
- the thesis proposal preparation of 6 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;
- 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. The (minimum) study load determination criteria for the various education activities are shown in the following table.

Activity	Study load / contact time
Lecture, with assignment	≥ 3 hours / hour
Assignment	1 hour / hour
Workshop	1-2 hours / hour
Fieldtrip	≥ 8 hours / day
Fieldwork	≥ 8 hours / day
Laboratory session	≥ 1-2 hours / hour

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

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

Education and Examination Regulations 2011– 2012

For the Master Programmes in:

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

Approved by the Academic Board of UNESCO-IHE, 29 September 2011

3.1 General Information

Article 1 Scope of the regulations

1.1 The present regulations apply to the education and examinations within the above mentioned master programmes 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 of joint specialisations (see art. 3.2) the present regulations also apply for the part of the programmes offered by UNESCO-IHE.

1.3 In case a joint specialisation leads to a double 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 cooperation agreement between UNESCO-IHE and the partner institute.

Article 2 Definition of terms

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

Act : the Higher Education and Scientific Research Act (*Wet op Hoger Onderwijs en Wetenschappelijk Onderzoek*);

Module : a self-contained programme unit with specified learning objectives, as stipulated in article 7.3 of the Act;

Rector : the rector of the Institute;

ECTS : the European Credit Transfer and Accumulation System;

Examination : an interim study performance assessment for a component of the programme (in the Act: *tentamen*);

Constituent examination : an examination consisting of a number of different parts (e.g. assignments, written or oral exams, presentations)

Examination board : the committee as stipulated in article 7.12 of the Act;

Practical: a practical educational activity as stipulated in article 7.13, paragraph 2, clause d of the Act, taking one of the following forms:

- the writing of a report or thesis;
- producing a report, study assignment or design;
- conducting a test or experiment;
- performing an oral presentation;
- participating in groupwork, fieldwork or a fieldtrip;
- conducting a research assignment; or
- participation in other educational activities that aim to develop specific skills.

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

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

Article 3 Programme and specialisations

3.1 The programmes are characterised as post-initial master programmes in scientific education, as stipulated in article 7.3b of the Act.

3.2 The following specialisations are distinguished within the programmes:

Municipal Water and Infrastructure programme:

1. Water Supply Engineering;
2. Sanitary Engineering;
3. Joint specialisation in Water Supply Engineering with Kwame Nkrumah University of Science & Technology, Ghana;
4. Joint specialisation in Sanitary Engineering with Kwame Nkrumah University of Science & Technology, Ghana;
5. Joint specialisation in Water Supply Engineering with Universidad del Valle, Colombia;
6. Joint specialisation in Sanitary Engineering with Universidad del Valle, Colombia; and

7. Joint specialisation in Urban Water and Management with Asian Institute of Technology, Thailand.

Environmental Science programme:

1. Environmental Science and Technology;
2. Environmental Planning and Management;
3. Water Quality Management;
4. Joint specialisation in Limnology and Wetland Ecosystems with Institute of Limnology, Austria and Egerton University, Kenya;
5. Joint specialisation in Environmental Technology for Sustainable Development with Asian Institute of Technology, Thailand; and
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;
2. Joint specialisation in Hydrology and Water Resources with Hohai University, China P.R.;
3. River Basin Development;
4. Coastal Engineering and Port Development;
5. Joint specialisation in Coastal Engineering and Port Development, with Hohai University, China P.R.;
6. Land and Water development;
7. Joint specialisation on Land and Water development with Sriwijaija University, Palembang, Indonesia;
8. Joint specialisation on Agricultural Water Management for Enhanced Land and Water Productivity with Asian Institute of Technology Thailand;
9. Agricultural Water Management for Arid and Semi-Arid Climates with Haramaya University, Ethiopia;

10. Hydroinformatics;
11. Joint specialisation in Hydroinformatics with Hohai University, China P.R.;
12. Joint specialisation in Hydroinformatics with Universidad del Valle, Colombia;
13. Joint specialisation in Hydroinformatics with Ain Shams University, Egypt;
14. Ecohydrology (Erasmus Mundus programme); and
15. 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, as stipulated in article 7.10, paragraph 1 of the Act.

3.2 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 normally 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. 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.

3.3 Content of the Programme

Article 9 Composition of the specialisations and joint specialisations

9.1 The composition of each programme specialisation is defined in Appendix C.

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.

3.4 Examinations

Article 11 Sequence of the examinations

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

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

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 re-examinations normally take place during the next examination period indicated in the academic calendar. The students involved are notified sufficiently in advance in writing about the date and time allocation for re-examinations. All students will take the re-sit at the same time.

12.6 Students will not be allowed to sit for further re-examinations and -assignments if they failed more than three re-examinations for the first 13 modules of the programme.

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

Article 13 The nature of the examinations

13.1 The constituent parts of a module are 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 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. A break of 15 minutes is allowed.

13.4 The nature of the examinations for each module in each programme is indicated in Appendix C, and is described separately in the in each module sheet.

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

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

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

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

17.3 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.

3.5 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:

- 9.1-10 outstanding
- 8.6-9.0 very excellent
- 8.1-8.5 excellent
- 7.5-8.0 very good
- 7.0-7.4 good
- 6.0-6.9 sufficient
- 5.9- and below insufficient - fail

18.2 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 must be stated in the module sheet.

18.3 The examiner shall assess a written examination or practical paper within a period of 14 days after the date of the examination.

18.4 All written examination work of the students will be blind corrected by the examiners involved.

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

18.6 The examination committee for the thesis examination shall determine the result after the defence. The mark shall be communicated to the student before the diploma awarding.

18.7 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.

18.8 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.

18.9 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.

3.6 Thesis Examinations

Article 21 Periods and frequency of thesis examinations

21.1 The thesis will be assessed by a thesis examination committee, consisting normally of 3 members (or in special circumstances of maximum 4 members); (at UNESCO-IHE) a professor as chairman, the mentor and one or two external examiners.

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 not involved in the supervision of the research work.

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 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 re-sit shall be taken within three months of the first attempt.

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

21.7 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.

21.8 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.

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.

3.7 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 successfully completed all examinations of the programme.

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 The degree will be awarded with distinction if the candidate obtained a mark of 8.5 or higher for the thesis examination, and an arithmetic average mark of 8.0 or higher for all other examinations in the programme that are assessed on a numerical scale, conform article 2.1.

Article 26 Diploma and supplement

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

26.2 In addition to the diploma, the graduate receives a diploma 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.

3.8 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 After consultations, 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.

Article 30 Evaluation of the programme

30.1 All taught components of the programme are routinely evaluated via a standardised questionnaire, which is completed by the students during a class session.

30.2 The evaluation class session for a programme component is held after students have submitted all examination material, and before the examination results are being notified to the students.

30.3 Upon explicit request by the students or a student representative, an oral evaluation discussion may be organised at any time. The purpose of such a discussion is entirely to obtain specific information or suggestions for improvement of a programme component.

3.9 Final Articles

Article 31 Amendments

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

31.2 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 32 Unforeseen situations

32.1 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 33 Publication

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

Article 34 Period of application

34.1 These regulations take effect for the academic year 2011– 2012. Approved by the Academic Board of UNESCO-IHE on 29 September 2011

3.10 Appendix A Qualifications of Graduates ES

- [1] Knowledge and understanding:
- Knowledge of current theory and contemporary developments in Environmental Science.
- Knowledge of physical, chemical and biological processes of the environment.
- Understanding of what is meant by “sustainability” and “wise use” of natural resources.
- The ability to describe the rationale for an integrated and interdisciplinary approach for managing the environment.
- Understanding the broader scientific, engineering and socio-economic context and the role of other disciplines required for Environmental Science.

Environmental Science and Technology

- To list concepts, instruments and technologies for pollution prevention, treatment and remedial action.

Environmental Planning and Management

- Knowledge of economic, institutional and legal principles, approaches and instruments relating to the environment.
- To list and explain legislative, institutional and management principles and arrangements.

Water Quality Management

- The ability to recognize the pollution impacts on water quality and identify remedial actions.
- To list and explain legislative, institutional and management principles and arrangements.

Limnology and Wetland Ecosystems

- The ability to recognize the pollution impacts on water quality and identify remedial actions.

[2] Applying knowledge and understanding:

- The ability to contribute to theoretical, methodological or applied developments in environmental science.
- The ability to prepare and implement a sound plan for environmental research.
- The ability to collect, analyse and organise relevant information and to draw sound conclusions on environmental issues.

Environmental Science and Technology

- To select and apply instruments and technologies for pollution prevention, treatment and remedial action.

Environmental Planning and Management

- To contribute to managing environmental systems and organisations and to the development of the institutional arrangements of the latter.

- To design and apply models for institutional development in water policy.
- To design and facilitate stakeholder involvement in decision-making processes.
- To formulate environmental policy strategies.

Water Quality Management

- To apply experimental, statistical and modelling tools for interpreting and designing water quality management programmes.

Limnology and Wetland Ecosystems

- To apply experimental and modelling tools for managing freshwater ecosystems.
- To apply knowledge of processes and functions of freshwater ecosystems in their management and protection.

[3] Making judgements:

- The ability to decide between different environmental ideas and approaches independently, based on available information, and to assess the potential for their application, integration and further development.
- The ability to select and apply a variety of techniques, tools and procedures in order to evaluate the environmental consequences of different development and intervention scenarios.
- The ability to reflect critically on the impacts of different activities on the environment.

Environmental Science and Technology

- To develop technological solutions for environmental problems based scientific knowledge.

Environmental Planning and Management

- To enumerate ecological and socio-economic functions and values of an environmental system and related, competing stakeholder interests.
- To design environmental policies that incorporate technical, administrative and financial aspects.

Water Quality Management

- To develop on the basis of scientific knowledge, technical and managerial solutions for water quality problems.

Limnology and Wetland Ecosystems

- To develop on the basis of scientific knowledge, technical and managerial solutions for problems in freshwater ecosystems.

[4] Communication:

- The ability to report and communicate environmental results clearly, and to explain and defend the reasoning, knowledge and assumptions to a variety of audiences.
- The ability to function effectively in a multi-disciplinary team.

Environmental Planning and Management, Water Quality Management

- The capability to assess interests among different stakeholders and to facilitate decision-making processes.

[5] Learning skills:

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

3.11 Appendix A Qualifications of Graduates MWI

[1] Knowledge and understanding:

- Knowledge of relevant theory and the contemporary developments in the field of study;
- Understanding of the required basic physical, applied mathematical and computing principles and the capability to integrate these within the appropriate discipline;
- Appreciation of the broader scientific, engineering and socio-economic framework, and recognition of the relevant disciplines and sub-disciplines that are related to the own discipline.

[2] Applying knowledge and understanding:

- The ability to apply disciplinary knowledge, academic capabilities and engineering skills independently and within a multidisciplinary context;
- The ability to select and apply suitable techniques and methods for analysis, assessment, planning, design, operation, rehabilitation and maintenance;
- The ability to independently formulate the appropriate questions, to identify and formulate appropriate approaches, and to pose original models, tests and/or engineering solutions;
- The ability to collect, analyse and structure required data and information and to recognise relations in them.
- The ability to prepare a research plan, including the description of the approach, the realisation of the research and the evaluation of the results.
- The attitude and the ability to contribute to theoretical, methodological or application development within the respective discipline.

[3] Making judgements:

- The ability to critically assess own investigation results, implementation feasibility and risks, and the ability to reflect on the ethical and socio-economic aspects connected with application;
- The ability to identify original ideas and approaches from the literature or other sources and assess the potential for application, integration or further development.

[4] Communication:

- The competence to clearly report and orally communicate results, the underpinning reasoning, knowledge and assumptions.

[5] Learning skills:

- The ability to extend and enhance the own knowledge, insight and skills in an autonomous manner.
- The ability to conduct independent academic research in a subsequent post-graduate (i.e., PhD) programme.

3.12 Appendix A Qualifications of Graduates WM

[1] Knowledge and understanding:

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

[2] Applying knowledge and understanding:

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

[3] Making judgements:

- The ability to decide between different ideas and approaches independently, based on available information, and assess the potential for application, integration and further development.
- 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.
- The ability to reflect critically on how different activities impact on the wise use of water.

[4] Communication:

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

[5] Learning skills:

- The ability to extend and enhance one's own knowledge, insight and skills in an autonomous manner.

3.13 Appendix A Qualifications of Graduates WSE

[1] Knowledge and understanding:

- Knowledge of current disciplinary theory and the contemporary developments in the field of study within the context of water science and engineering;
- Understanding of the required basic physical, applied mathematical and computing principles and the capability to integrate these within the appropriate discipline;
- Appreciation of the broader scientific, engineering and socio-economic framework, and recognition of the relevant disciplines and sub-disciplines that are related to the own discipline.

[2] Applying knowledge and understanding:

- The ability to apply disciplinary knowledge, academic capabilities and engineering skills independently and within the multidisciplinary context of water science and engineering;
- The ability to select and apply suitable techniques and methods for analysis, assessment, planning, and where appropriate, design, construction, operation and maintenance;
- The ability to independently formulate the appropriate questions, to identify and formulate appropriate and approaches, to pose original models, tests and/or engineering solutions;
- The ability to collect, analyse and structure required information and to recognise relations in that information;
- The ability to prepare a research plan, including descriptions of the approach, the realisation of the research and the evaluation of the results, and the time planning for the research;
- The attitude and the ability to contribute to theoretical, methodological or application development within the respective discipline.

[3] Making judgements:

- The ability to critically assess own investigation results, implementation feasibility and risks, and the ability to reflect on the ethical and social aspects connected with application;
- The ability to identify original ideas and approaches from the literature or other sources and assess the potential for application, integration or further development.

[4] Communication:

- The adequacy to clearly report and orally communicate results, the underpinning reasoning, knowledge and assumptions, and where appropriate, to ensure the practical implementation of scientific or engineering solutions.

[5] Learning skills:

- The ability academic attitude to extend and enhance the own knowledge, insight and skills in an autonomous manner.

3.14 Appendix B Eligible Bachelor's Degrees for Academic admission

The specialisation in Water Supply Engineering accepts applicants with a BSc degree in civil, chemical, environmental, hydraulic or mechanical engineering.

The specialisation in Sanitary Engineering accepts applicants with a BSc degree in civil, environmental or chemical engineering, or in microbiology.

The specialisation in Integrated Urban Engineering accepts applicants with a BSc degree in civil engineering.

The specialisation in Hydrology and Water Resources accepts applicants with a Bachelor of Science degree in civil or agricultural engineering, earth sciences, environmental sciences, or physics.

The specialisation in Hydroinformatics accepts applicants with a Bachelor of Science degree in civil, agricultural or systems engineering, earth sciences, environmental sciences or physics.

The specialisations in Hydraulic Engineering and River Basin Development, and Hydraulic Engineering - Coastal Engineering and Port Development accept applicants with a Bachelor of Science degree in civil engineering or related field with a hydraulic engineering background.

The specialisation in Hydraulic Engineering - Land and Water Development accepts applicants with a Bachelor of Science degree in civil or agricultural engineering, or a related field.

The Water Management programme accepts applicants with a good Bachelor's degree in the fields of engineering, natural sciences, economics and the social sciences.

For the Water Resources Management specialisation, affinity with quantitative methods is essential. Similarly, for the Water Quality Management specialisation, affinity with chemistry and biology is desired. For the Water Services Management specialisation a professional background in the water utility sector is desired. And for the Water Conflict Management specialisation interest in local, national and international water management is desired.

The specialisation in Environmental Science and Technology accepts applicants with a BSc degree in civil, chemical, agricultural or environmental engineering, natural sciences, chemistry, environmental science, agriculture, or in geology.

The specialisation in Environmental Planning and Management accepts applicants with a BSc degree in civil, chemical, agricultural or environmental engineering, natural sciences, chemistry, environmental science, agriculture, geology, geography, or in environmental economics.

The specialisation in Water Quality Management accepts applicants with a BSc degree in civil, chemical, agricultural or environmental engineering, natural sciences, chemistry, environmental science, agriculture, or in geology.

The specialisation in Limnology and Wetland Ecosystems accepts applicants with a BSc degree in civil, chemical, agricultural or environmental engineering, natural sciences, chemistry, environmental Science, agriculture, or in geology.

3.15 Appendix D 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 and an electronic language dictionary 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 and language translation 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.

3.16 Appendix E Result form MSc research proposal

Date: _____

The supervisor and the mentor of Mr./Ms. _____

of programme _____ with specialization _____

consider the result of the MSc Research Proposal as being:

SATISFACTORY/UNSATISFACTORY*

Title MSc Research Proposal:

Further remarks:

Name and signature supervisor: Name and signature mentor:

* delete what is not applicable

3.17 Appendix F Criteria for the MSc thesis evaluation

Approved by the Academic Board (05.03.2009).

To be used by the MSc Examination committees and the participants as a guide.

(Does not replace the standard evaluation form.)

Participant's name	
Topic	
Mentor	
Supervisor	
Date	

Criteria	possible comments
1. THESIS	
Abstract <ul style="list-style-type: none"> • Are motivation and objectives presented correctly? • Are own contribution, results and conclusions presented? • Is it clearly written? 	
Introduction <ul style="list-style-type: none"> • Does it really introduce the work? • Does it logically lead to research questions and objectives? • Are objectives and goals (specific objectives) clearly formulated? 	
Background/literature review <ul style="list-style-type: none"> • Are enough sources covered? • Is literature relevant and up-to-date? 	
Materials & methods <ul style="list-style-type: none"> • Are methods explained clearly enough to understand their relevance and use? • Is quality assurance/quality control adequately addressed in experimental work? 	
Discussion <ul style="list-style-type: none"> • Is discussion systematic and comprehensive? • Does it lead to conclusions? 	
Conclusions <ul style="list-style-type: none"> • Are objectives achieved? • Are conclusions formulated concisely? • Are recommendations for future work given? 	

Criteria	possible comments
1. THESIS (<i>continue</i>)	
Tables and figures <ul style="list-style-type: none"> • Do captions clearly explain contents of the Figures? • Are formatting and quality adequate? 	
References, proper citation <ul style="list-style-type: none"> • Is material from other publications properly attributed and/or cited? • Are references and citations properly formatted? 	
Editorial aspects <ul style="list-style-type: none"> • Is structure clear and logical? • Is spelling and grammar adequate? • Are text, headings, graphs and tables understandable? • Is layout appropriate? 	
2. WORK PROCESS	
Creativity <ul style="list-style-type: none"> • Was participant generating new ideas, critical to the results published elsewhere? • Was participant creative, what is his/her own scientific contribution? 	
Critical capacity <ul style="list-style-type: none"> • Are the limitations of the study understood and explained? • Does the participant show a capacity for self-criticism? • Are their clear suggestions for further research priorities? 	
Other aspects <ul style="list-style-type: none"> • Was the participant really committed to work? • Was the participant working independently? • Were comments of the supervisors and reviewers taken into account? 	
3. PRESENTATION	
<ul style="list-style-type: none"> • Is presentation properly structured? • Is timing good? • Is the balance of material on slides appropriate (not too much / too little)? • Are all major aspects of work presented? • Are all questions answered well? 	

4 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.

5 Code of Conduct

THE RECTORATE OF UNESCO-IHE

In consideration of the need for rules and regulations concerning the safety and the proper use of the buildings, grounds and facilities of UNESCO-IHE by students and visitors;

In accordance with article 7.57h and article 9.2, first paragraph, of the Higher Education and Scientific Research Act of the Netherlands;

Having heard the Student Association Board;

RESOLVES

To establish the following Regulations:

Article 1 Definitions

1.1 WHW

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

1.2 the Director

The director of UNESCO-IHE

1.3 the Rectorate

The director and the deputy director

1.4 Central services department

The central services department of UNESCO-IHE

1.5 Facilities

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

1.6 Buildings

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

1.7 Student

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

1.8 Visitor

Anyone who is not a student nor is employed by IHE-Delft as referred to in article 1.1 of

the Collective Labour Agreement (CAO) for Dutch Universities.

Article 2 Compliance requirement for rules, guidelines and instructions

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

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

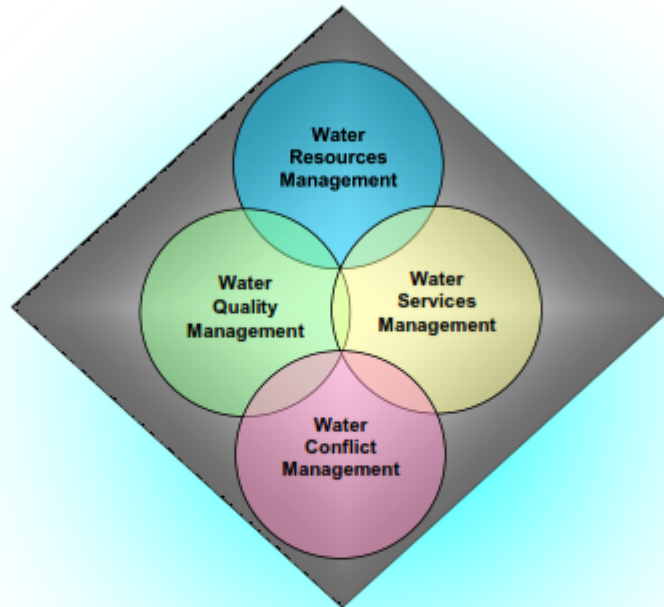
Article 6 Entry into force

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



INTERNATIONAL MASTER'S PROGRAMME IN

Water Management

Handbook 2011 - 2013

Coordinator WRM Specialization - [Marloes Mul](#)
Coordinator WSM Specialization - [Maria Rusca](#)
Coordinator WCM Specialization - [Jeltsje Kemerink](#)
Coordinator WQM Specialization - [Peter Kelderman](#)
MSc Research Coordinator - [Klaas Schwartz](#)

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.

6.1 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.

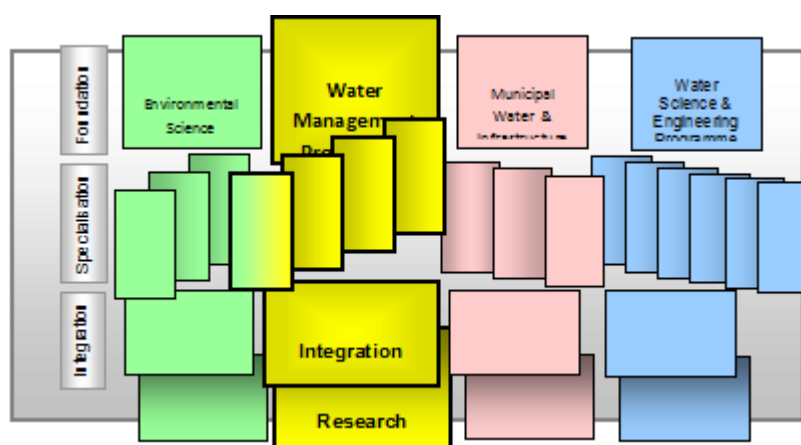


Figure 1 Sharing Specialisations between UNESCO-IHE Master's Programmes

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.

6.2 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.

6.3 Specialization

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.

6.4 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.

6.5 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.

6.6 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.

6.7 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.

6.8 Academic Staff

Programme committee

Prof. P. van der Zaag, PhD Chair, Head WRM Core

J. Kemerink, MSc. Programme Coordinator/ (Acting) Mentor WCM

K.H. Schwartz, PhD MSc Research coordinator

Prof. M.P. van Dijk, PhD Member, Head WSM Core

M.L. Mul, PhD Member, Mentor WRM

P. Kelderman, PhD Member, Mentor WQM

M. Rusca, PhD Member, Mentor WSM

A. Mehari-Haile, PhD Member representative WSE

E.A. de Jong, MSc Head Educational Affairs

Module coordinators

WM1 K. Schwartz & M. Rusca

WM2 Y. Mohamed & I. Masih

WM3 M. Rusca & J. Kemerink

WM4 P. Libaudière

WCM5 P. van der Zaag

WQM5 P. Kelderman

WSM5 M. Rusca (Acting)

WRM6 S. Graas

WSM6 K. Schwartz

WQM6 H. van Bruggen

WCM6 P. van der Zaag

WRM7 I. Masih

WQM7 M. Hamdard

WSM7 S. Mugisha & P. Libaudière

WM8 F. Jaspers & J. Kemerink

WM9 S. Graas & N. van Couwenberg

WRM10 Y. Mohamed

WQM10 G.M. Gettel

WSM10 M. Blokland

WQM11 M. Mul & M. Hamdard

WSM11 P. Libaudière & M.P. van Dijk

WM12 K. Schwartz & S. Graas

WM13 & WM15 K. Schwartz

Academic Staff in Water Management Programme

R. Ahlers, PhD Senior Lecturer in Water Governance

E.O. Akinyemi, PhD Senior Lecturer in Transport Engineering

M.W. Blokland Associate Professor of Water Services Management

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

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

J.P. Buiteman, MSc Senior Lecturer in Sanitary Engineering

R.W. Camies Producer Video and Multimedia

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

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

L.P. Darvis, BA Librarian

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

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

S. Graas, MSc Lecturer in Water Systems Modelling

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

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

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M. Hofstra, MSc Senior Advisor Policy Analysis and Water Governance

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J.S. Kemerink, MSc Researcher/Lecturer IWRM

F. Kruis, BSc Head of Environmental Laboratory

S. Maskey, PhD Senior Lecturer in Hydrology

Y. Mohamed, PhD Senior Lecturer in Water Resources Management

S. Mugisha, PhD Lecturer in Water Services Management

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

J.C. Nonner, MSc Associate Professor of Geohydrology

I.P. Popescu, PhD Senior Lecturer in Hydroinformatics

M. Rusca , PhD Lecturer in Water Governance

M. Ronteltap, MSc Lecturer in Water Supply

E. de Ruyter, PhD Senior Lecturer Aquatic and Marine Ecology

L. Salame, MA Lecturer in Water Conflict Management

K.H. Schwartz, PhD Lecturer Institutional Development

S.K. Sharma, PhD Lecturer in Water Supply

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

W.J. Sturrock Lecturer in English Communication Skills

S. Uhlenbrook, PhD Professor of Hydrology

N. van Cauwenbergh Lecturer in Water Resources Management

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

J. Wenninger, PhD 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 D elgado, MSc Wageningen University

M. Vis, PhD Delft Hydraulics

J. Vymazal, PhD ENKI Trebo

A. Wolf Oregon State University

7 Facilities

7.1 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

7.2 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.

7.3 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.

7.4 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.

7.5 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. A photocopy service near the entrance is available to students at all times. 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, using the chip-card.

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.

7.6 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

7.7 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.

7.8 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.

7.9 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.

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WATER MANAGEMENT

MASTERS PROGRAMME

Academic Year: 2011-2013
 Specialization: Core Programme
 Module Coordinator: Klaas Schwartz/Maria Rusca

Module Sheet

Module Name		Module Code	Credits
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.

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; Practical Examples of Research Projects; Referencing; What is an MSc?; 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**
- **25%: Assignment**

UNESCO-IHE - MSc Module 2011/2013-WM01: Principles of Integrated Water Resources Management

Nr	Course/Topic	lecture	exercise	workshop	labwork	fieldwork	fieldtrip	selfstudy	contact hours	study/load hours	Lecturer(s)
1	IWRM Principles - Concepts and Definitions	2									Van der Zaag
1.1	Water Resources	2									Van der Zaag
1.2	Water Demand	2									Van der Zaag
1.3	Water Allocation	2									Van der Zaag
1.4	Water Governance	2									Van der Zaag
1.5	Emerging Issues	2									Van der Zaag
2	Introduction GIS	2									Mohamed
2.1	Vector data analysis			4							Mohamed
2.2	Raster data analysis			4							Mohamed
2.3	Image data analysis			4							Mohamed
2.4	Remote sensing			4							Mohamed
2.5	Application of GIS and Remote Sensing to WM		4								Mohamed
3	What is Science?	4									Irvine
3.1	Different Approaches to Scientific Methodology	4									Ahlers
3.2	Practical Examples of Research Projects	2									Irvine
3.3	What is an MSc?	2									Ahlers
3.4	Critical reading	4									Ahlers
3.5	Referencing	2									Darvis
Total		32	4	16							

WATER MANAGEMENT

MASTERS PROGRAMME

Academic Year: 2011-2013
 Specialization: Core Programme
 Module Coordinator: Y. Mohamed and I. Masih

Module Sheet

Module Name 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. This module should be followed in conjunction with WM01.	

Learning Objectives

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

- Understand how the physical system works, and illustrate the interaction between quantity and quality (chemical, biological, ecological), between surface water, soil water and groundwater, between stocks and fluxes. Major natural functions and human use of river systems.
- Demonstrate a good understanding of the essentials to characterise the quantitative and qualitative nature of a water resources system. He or she will be able to interpret and assess the statistical significance of flux variability, of both the water supply and use in a water resources system.
- Reproduce the main issues of debate in a river system, and identify major natural functions and human use of river systems.

Topics and Learning Activities

Hydrology:

Hydrological cycle; water balance. Precipitation and evaporation. Principles of hydrology of surface and groundwater; water resources assessment; simple models for water resources analysis and modelling (incl. rainfall runoff relationships); floods and droughts, operation of reservoirs. Introduction to groundwater resources system. Workshop on Hydrology: Spreadsheet analysis will be used for: Rainfall data analysis, statistical analysis of time series data, evaporation data and for the computation of 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:

Chemistry and Aquatic Ecosystems: chemical reactions; acids, bases, buffers in natural waters; precipitation and dissolution; redox reactions in the environment. Photosynthesis; eutrophication.

Learning Activities:

The learning activities include lectures, exercises and laboratory work.

The lectures are accompanied by PowerPoint presentations. These will be available to the participants for self study.

River Systems:

Natural functions and human use of rivers; river characteristics; threats from rivers, rivers as input-output systems, water quality and riverine ecosystems, environmental controls on rivers.

Learning Activities:

The learning activities include lectures and exercises.

The lectures are accompanied by PowerPoint presentations. These will be available to the participants for self study.

Lecturing Material

- Principles of Hydrology, de Laat et al. UNESCO-IHE Lecture Notes.
- Water Chemistry and Biology, Kelderman. UNESCO-IHE Lecture Notes.
- Introduction to Hydrogeology, Taylor and Francis.
- Loucks, D., and E. van Beek (2005), Water resources systems planning and management, UNESCO Publishing, Paris, France.

Assessment

• 75%: Written Exam (closed book)

• 25%: Assignment

UNESCO-IHE - MSc Module 2011/2013-WM02: Water Resources System											
Nr	Course/Topic	lecture	exercise	workshop	labwork	fieldwork	fieldtrip	selfstudy	contact hours	studyload hours	Lecturer(s)
1	Introduction										Mohamed & Vd Krogt
1.1	Introduction to module	2							2	2	
1.2	Water Resources System	4							4	4	
2	Hydrology										Mohamed, Nonner, Masih
2.1	Concepts of Hydrology, Hydrological Cycle, Water Balance	2		4					6	12	
2.2	Precipitation	2		4					6	12	
2.3	Evaporation & Transpiration	2		4					6	12	
2.4	Surface water resources	2		4					6	12	
2.5	Groundwater Resources	4							4	8	
2.6	Reservoir operation	2		4					6	12	
3	Water Chemistry & Aquatic Ecosystems	11			6				17	42	Kelderman
3.1	Introduction										
3.2	Water Quality Monitoring										
3.3	Pollution										
4	River Systems										Crosato
4.1	Natural Functions & Human Use / Threats	2							2	4	
4.2	Rivers as input-output systems, quality & riverine ecosystems	2							2	6	
4.3	River Characteristics & Environmental controls on rivers	4							4	12	
5	Exam									3	
Total		39		20	6				65	141	

WATER MANAGEMENT

MASTERS PROGRAMME

Academic Year: 2011-2013
Specialization: Core Programme
Module Coordinator: J.Kemerink, MSc /M. Rusca, PhD, MSc

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; basic PC-computer knowledge (MS-Windows, MS-Office); good English command.		

Learning Objectives

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

- Identify and analyze multiple perspectives on problem framing
- Discuss and analyze dynamic and political nature of water governance
- Recognize and apply concepts and theories in relation to water governance

Topics and Learning Activities

Introduction to water governance and basic concepts (incl. institutions, policies and organizations)

Learning Activities:

Lectures, Movie

History of water governance and processes of change

Lectures

Water and politics

Lectures

Instruments and experiences of governance in the water sector (case-studies)

Lectures

Case Study Method

Lectures, Workshop

Lecturing Material

- Articles
- Books
- Power Point Presentations

Assessment

- 50%: Written Exam (open book)
- 50%: Assignment

UNESCO-IHE - MSc Module 2011/2013-WM03: Water Governance

Nr	Course/Topic	lecture	exercise	workshop	labwork	fieldwork	fieldtrip	selfstudy	contact hours	study/load hours	Lecturer(s)
1	Concepts of Water Governance										
1.1	Introduction to the Module	1							1	1	Kemerink/Rusca
1.2	Governance: an introduction	2							3	9	Rusca
1.3	Participation	3							3	9	Kemerink
1.4	Introduction to the assignment	2							2	2	Kemerink/Rusca
1.5	Case study Method	4							4	12	Schwartz/Ahlers
1.6	Interview Techniques	1		2					3	5	Ahlers/Kemerink
2	Shifts in Governance										
2.1	Introduction Shifts in Governance	3							6	9	Kemerink/Schwartz
2.2	Film: Cadillac Desert		2						2	2	Kemerink/Rusca
2.3	TVA	2							2	6	Guest Lecturer
3	Politics of Governance										
3.1	Introduction to Politics	3							3	9	Rusca
3.2	Legal Pluralism	2							2	6	Kemerink
3.3	Water and Politics: everyday politics	2							2	6	Guest Lecturer
3.4	Water and Politics: politics of policy	2							2	6	Guest Lecturer
3.5	Water and Politics: global politics	2							2	6	Ahlers
3.6	Film: Life and Debt	2							2	2	Ahlers
	Assignment		45						40	45	Kemerink/Rusca/Schwartz
	Tutorials		4						4	4	Various Lecturers
	Assignment presentation		2						2	2	Kemerink/Rusca/Schwartz
	Exam								3		
Total		31	53		2				88	141	

WATER MANAGEMENT

MASTERS PROGRAMME

Academic Year: 2011-2013
 Specialization: Core Programme
 Module Coordinator: P.J.M. Libaudiere, MSc

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..

- Define the basic principles of water economics.
- Distinguish the role of water economics in water management, its possibilities and its limitations.
- Comprehend the key approaches used in water economics.
- Reproduce the major methods used in water economics.
- Recognize issues that can be analyzed with specific economic or management tools.
- List/describe the major advantages/limitations of applying economic principles to water allocation problems.

Topics and Learning Activities

1. Introduction to water economics and six practical illustrations.

Defining the role of economics in water management and cases from the SWITCH-project.

Learning Activities:

Lecture, group exercise/workshop

2. Water, economics and policy issues.

Role of economic valuation in water management; supply enhancement and demand management; different economic schools

Learning Activities:

Lecture, group exercise/workshop

3. The economic value of water, demand analysis, water pricing and water markets.

Types of water values; non-market valuation methods ; theory of economic rents; examples of water values; water charges; the objectives of rate setting; economic theory of pricing; water trade and value theory; water transfers; market failures; examples of water markets

Learning Activities:

Lecture, group exercise/workshop

4. Introduction to hydro-economic modelling and optimal water allocation.

Marginal net benefit functions; opportunity costs, economic efficiency

Learning Activities:

Lecture, group exercise/workshop

5. Engineering economics.

Time value of money; discounting; NPV; IRR; CBA

Learning Activities:

Lecture, group exercise/workshop

6. Ravilla roleplay.

Roleplaying game, students will represent different stakeholders in a RBO and will need to negotiate.

Learning Activities:

Exercises

7. Fieldtrip.

Destination to be announced.

Learning Activities:

Fieldtrip

Lecturing Material

- Lecture notes by prof. M.P. van Dijk.
- 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. 397pp.

Assessment

- 50%: Assignment
- 50%: Written exam (closed book)

UNESCO-IHE - MSc Module 2011/2013-WM04: Water Economics											
Nr	Course/Topic	lecture	exercise	workshop	labwork	fieldwork	fieldtrip	selfstudy	contact hours	studyload hours	Lecturer(s)
1	Introduction to water economics and six practical illustrations										
1.1	Introduction to water economics	4							4	12	prof. M.P. van Dijk
1.2	Six practical illustrations from the SWITCH-report			6					6	9	prof. M.P. van Dijk
2	Water, economics and policy issues	4		2					6	15	To be announced
3	The economic value of water, demand analysis, water pricing and water markets										
3.1	The economic value of water and demand analysis	4		8					12	24	To be announced
3.2	Water pricing and water markets	4		2					6	15	To be announced
4	Introduction to hydro-economic modelling & optimal water allocation	4		4					8	21	To be announced
5	Engineering Economics	2		8					10	24	To be announced
6	Ravilla roleplay		21						21	21	To be announced
7	Fieldtrip						4	4	4		To be announced
	Exam									3	
Total		22	21	30			4		77	144	

WATER SCIENCE AND ENGINEERING

MASTERS PROGRAMME

Academic Year: 2011-2013
 Specialization: Core Programme
 Module Coordinator: P. Kelderman, PhD, MSc

Module Sheet

Module Name	Module Code	Credits
Water Quality Assessment (SEE MODULE: ES05W)	WQM05	5
Target Group Students interested in interaction between structures and geotechnics, dredging operations, dredging projects tender procedures and marine geotechnical investigations	Prerequisites Basic knowledge in soil mechanics (see for example WSE/HECEPD/03/s)	

Learning Objectives

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

- Assess geo-engineering aspects of different hydraulic engineering activities such as structure soil interaction and foundation methods and to apply standard soil mechanical calculation methods;
- Assess the use of sheet piling in quay wall design and will be able to apply analytical and numerical methods used in designing a sheet pile;
- Assess the need of dredging, project phasing, soil investigation and production, survey systems, cost estimating and pricing, tender procedures and contracts;
- Assess the technical and contractual aspects of geomarine investigations and will be able to set up and organise a survey programme;

Topics and Learning Activities

Geo-Engineering

Earth retaining structures; gravity wall, analysis of sliding and overturning and allowable soil pressures; sheet pile wall, analytical and (Winkler) spring models, screwed anchors, grout anchors, anchor walls, struts, and anchor piles. Shallow foundations, calculations of bearing capacity under vertical and inclined loads according to Prandtl-Buisman's and Meyerhof's theory, settlement calculations, allowable deformations, mutual influencing of foundations. Deep foundations, overview of piling systems, determination of end bearing capacity and of positive and negative friction. Slope stability, according to Bishop's theory including the effect of an earthquake load and groundwater flow.

General exercise with a cantilever wall, a sheet pile, a shallow- and a pile foundation and slope stability of an embankment. Detailed analysis is made on a specific topic. The calculations are analytical and some numerical by use of the Delft Geosystems software.

Learning Activities:

Lectures and exercise

Sheetpile design

For the design of quay walls the knowledge of sheet piling gained in Geo-Engineering A and B is deepened and extended. Several mechanisms are dealt with in detail: piping, Kranz stability, heave, anchorage and special load cases. An overview of the different kind of quay walls and examples of repair and upgrade of existing structures is given and lessons learned are presented. In the assignment a quay wall is designed: sheet pile length, strength, deformation and anchorage. In the assignment, analytical and numerical methods (computer program MSHEET) are used.

Learning Activities:

Exercise

Marine Geotechnical Investigations

Characteristics of marine geotechnical investigations, geotechnical requirements, critical-path items, project planning, desk studies, existing sources, available geotechnical data, specification for engineering geophysics and/or ground investigation, geotechnical hazards identified by desk studies, marine engineering geophysics, positioning, side scan sonar technique, seismic reflection magnetometer survey, marine ground investigations, investigation techniques, working platforms, seabed in-situ testing techniques, downhole in-situ testing techniques, seabed and downhole sampling techniques, common pitfalls, integration into contracts.

Learning Activities:

Lectures

IADC Dredging Seminar

The seminar focuses on the need of dredging, project phasing, soil investigation and production, survey systems, cost estimating and pricing, tender procedures and contracts. The programme includes various workshops on identifying the need for dredging, preparation of a dredging and landfill project and preparing in competing groups a tender bid for a dredging contract as well as two field visits to the execution of a dredging and reclamation project and a yard of a dredging contractor (contractor's logistics).

Learning Activities:

Lectures and workshop

Lecturing Material

- Lubking, 2004. Soil mechanics > In: 0174 04
- Brinkman, 2006. Geo-Engineering 1 Earth Retaining Structures and Stability of Soil Mass > In: 0190 06
- Van der Veen, Brinkman 2005. Geo-engineering: Shallow foundations.
- Lubking P.: Details of the design for cantilever wall, sheet pile and anchor wall + Hand outs
- Peuchen J.: Marine Geotechnical Investigation, Lecture notes.
- Dredging Seminar Handbook, 2010, IADC

Assessment

- 70%: Oral Exam
- 30%: Assignment

UNESCO-IHE - MSc Module 2011/2013-WQM05: Water Quality Assessment (SEE MODULE: ES05W)											
Nr	Course/Topic	lecture	exercise	workshop	labwork	fieldwork	fieldtrip	selfstudy	contact hours	study/load hours	Lecturer(s)
1.1	Introduction on water quality	2							2	2	Kelderman
1.2	Water quality monitoring and assessment	8			5	5			18	39	Kelderman, Kruis
1.3	Groundwater monitoring	4							4	4	Foppen
1.4	Case study water quality monitoring			3					3	12	De Kruijf, Kelderman
2	Data analysis and presentation	6	4						10	18	Kelderman, van Dam
3	Aquatic ecotoxicology										De Kruijf
3.1	Principles of aquatic ecotoxicology	4							4	8	
3.2	Environmental fate of micropollutants	4							4	4	
3.3	Monitoring, modelling and risk assessment	4							4	12	
4	Water quality modelling	10	4						14	26	Meijers
	Fieldtrips						12	12	12	12	
	Examination								3	3	
Total		42	8	3	5	5	12	6	78	140	

WATER MANAGEMENT

MASTERS PROGRAMME

Academic Year: 2011-2013

Specialization: Core Programme

Module Coordinator: Prof. P. van der Zaag, PhD, MSc /L. Salame, LL.M

Module Sheet

Module Name		Module Code	Credits
Negotiation and Mediation for Water Conflict Management (I)		WCM05	5
Target Group Current and future water managers, decision-makers and others involved in water management. 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..

- 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.
- Assess the impact of human activities on water systems and the repercussion of such activities on water conflict and cooperation.
- Explain, discuss and analyze the basic concepts of conflicts related to water and of conflict management.
- Identify, explain and analyze the elements of a negotiation process applied to the management of a water conflict.
- Prepare, organize and engage in negotiation processes related to shared water resources with a variety of stakeholders groups.
- Apply a set of skills and tools needed for water conflict management through a negotiation process.

Topics and Learning Activities

Alternative dispute resolution approaches

This lecture presents the spectrum of alternative dispute resolution approaches. It will focus on negotiation techniques and styles. The various components of a negotiation process (trust, interests, alternatives, options, criteria & standards, communication, relationship, agreement) will be studied as well as key skills for successful conflict resolution (active listening, open ended questions, the 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. The skills of the students will be evaluated for the first time during Role play I.

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 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 the context in which negotiations are undertaken, for example. 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.

Summary of concepts

Review of key concepts.

Learning Activities:

The key concepts introduced in the previous lectures will be summarised and reviewed in a dynamic way.

Negotiation strategies and confidence-building measures

Development of negotiation strategy, Lessons learned (common errors etc.),
Confidence building measures.

Learning Activities:

This lecture aims to enhance a more in-depth understanding of prevention and resolution of international water disputes - as well as the actual potential role that the participants could play in such processes. 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
- Development of 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:

In this role play 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 rounds of negotiations will be simulated and feedback will be provided at the end by the teachers and the participants themselves.

The skills of the students will be re-evaluated for the second time during this role play. Both assessments will be compared and skills learning inferred.

Annotated bibliography

The students will be required to develop an annotated bibliography on a topic of their choice. They will have to 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 on International Negotiation; by Prof Paul Meerts.
- Sourcebook on Enhanced Negotiation Skills and Dispute Resolution of International Water Resources; by Prof. Jon Martin Trondalen.
- R. Fisher and W. Ury, 1991. Getting to Yes. Random House, London.

Assessment

- **40%: Written Exam (closed book)**
- **20%: Skills assessment**
- **40%: Assignment**

UNESCO-IHE - MSc Module 2011/2013-WCM05: Negotiation and Mediation for Water Conflict Management (I)

Nr	Course/Topic	lecture	exercise	workshop	labwork	fieldwork	fieldtrip	selfstudy	contact hours	study/load hours	Lecturer(s)
1	Introduction	2							2	6	Lena Salame, Pieter van der Zaag
2	Alternative dispute resolution approaches	6	12						18	30	Lena Salame
3	International Negotiation Processes	6	12						18	30	Wilbur Perlot with Paul Meerts
4	Summary of concepts	2							2	6	Lena Salame
5	Negotiation strategies and confidence-building measures	6	12						18	30	Jon Martin Trondalen
6	Cases of transboundary water conflicts or cooperation		6						6	6	Andras Szollosi-Nagy, Jon Martin Trondalen
7	Final role play		8						8	8	Ebel Smidt
8	Annotated bibliography	2	22						2	26	Lena Salame
	Exam									3	
Total		24	72						74	145	

WATER MANAGEMENT

MASTERS PROGRAMME

Academic Year: 2011-2013
Specialization: WM - WSM
Module Coordinator: M. Rusca, PhD, MSc

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.
- Understand and apply the knowledge on different types of water supply and sanitation systems and suitability of application under different conditions
- Discuss treatment processes, structural components, function and performance of water supply and sanitation systems
- Understand 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, field visits

Water treatment

Learning Activities:

Lectures, Design Assignment

Water transport and distribution

Learning Activities:

Lectures

Ecological Sanitation

Learning Activities:

Lectures

Sewerage and drainage systems

Learning Activities:

Lectures

Wastewater treatment processes and plants

Learning Activities:

Lectures, field visit

Lecturing Material

- Power point presentations.
- Field visits.

Assessment

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

UNESCO-IHE - MSc Module 2011/2013-WSM05: Water Supply and Sanitation Systems

Nr	Course/Topic	lecture	exercise	workshop	labwork	fieldwork	fieldtrip	selfstudy	contact hours	study/load hours	Lecturer(s)
1	Introduction to water supply and sanitation systems	3							3	9	TBA
2	Raw water and drinking water aspects	4							4	12	Buiteman
3	Conventional water treatment methods	6	4						10	26	Buiteman
4	Raw water abstraction, pre-treatment and storage	2							2	6	Buiteman
5	Water treatment processes and plants	4	4				4	4	8	16	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	2						6	16	Akinyemi
9	Wastewater treatment processes and plants	4	3				4	4	11	22	Saroj
	Exam									3	
Total		35	13	6			8		58	140	

WATER MANAGEMENT

MASTERS PROGRAMME

Academic Year: 2011-2013
 Specialization: Core Programme
 Module Coordinator: J.J.A. van Bruggen, PhD, MSc

Module Sheet

Module Name Wetlands for Water Quality (SEE MODULE: ES06W)		Module Code WQM06	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 aquatic ecology.		

Learning Objectives

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

- Assess the values of wetlands and explain the use of natural and constructed wetlands for the treatment of water;
- 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

UNESCO-IHE - MSc Module 2011/2013-WQM06: Wetlands for Water Quality (SEE MODULE: ES06W)

Nr	Course/Topic	lecture	exercise	workshop	labwork	fieldwork	fieldtrip	selfstudy	contact hours	study/load hours	Lecturer(s)
1	Introduction into the module	1							1	1	
2	Wetlands	8	2						10	24	
3	Wastewater treatment aspects	6							6	18	
4	Natural wetlands for water treatment	4							4	4	
5	Constructed wetlands	14							16	58	
6	Integrated production systems	6							6	18	
7	Fieldtrip						16	16	16	16	
8	Exam									3	
Total		39	2				16	16	59	142	

WATER MANAGEMENT

MASTERS PROGRAMME

Academic Year: 2011-2013
 Specialization: Water Resources Management
 Module Coordinator: S. Graas, MSc

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 a number of water resources models that simulate river basin processes.
- Clearly present the results of the water system models.
- Critically analyse model outcomes.
- 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.

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. 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 a journal article on the topic (selected by the lecturers) which is discussed during a session. The discussion will focus on the relevance of the 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%:

UNESCO-IHE - MSc Module 2011/2013-WRM06: Water Systems Modelling											
Nr	Course/Topic	lecture	exercise	workshop	labwork	fieldwork	fieldtrip	selfstudy	contact hours	studyload hours	Lecturer(s)
1.1	Why model	2									Graas
1.2	Modelling process	2									Mul
1.3	Calibration & Validation	2									Mul
1.4	Types of models	2									Graas
1.5	Optimisation vs Simulation	2									Mul
1.6	Examples of Software Packages for Water Systems Modelling	2									Graas, Popescu
2	River Basin Simulations - Practice		32	36					36	78	
2.1	HBV (rainfall-runoff)			12							Mul
2.2	Waflex (water allocation)			12							Graas
2.3	Mike 11 (flood)			12							Popescu
3	Paper discussion	4							4	12	Graas, Mul
4	Field trip						6	6	6	6	Graas, Smits
5	Case studies	6									
5.1	DSM Gist, Delft	2							6	6	Smits
5.2	Data Distributed Modelling	2									Winsemius
	Exam									3	
Total		38	32	72			6		64	141	

WATER MANAGEMENT

MASTERS PROGRAMME

Academic Year: 2011-2013
 Specialization: Water Conflict Management
 Module Coordinator: Prof. P. van der Zaag, PhD, MSc /L. Salame, LL.M

Module Sheet

Module Name		Module Code	Credits
Negotiation and Mediation for Water Conflict Management (II)		WCM06	5
Target Group Current and future water managers, decision-makers and others involved in water management. 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, water governance and economic development.
- 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.

Summary of concepts

A recap of all concepts presented during the module will take place with a Q/A session to prepare for the final role play of this module.

Learning Activities:

A review of all concepts presented.

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

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 immediately after the formal negotiations.

Essay

The students will be required to develop an essay on a topic of their choice. They will have to submit it at 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 students will be asked to prepare an essay on a topic of their choice, based on a review of relevant scientific literature. They will have to:

- o Introduction: Introduce the topic, defining a precise problem statement, research question or hypothesis
- o Review: Present the main ideas and issues on the debate, i.e. outline the different positions or view points and interests at stake.
- o Discussion: Give their own point of view on the topic and relate the topic in question to their own situation and experience.
- o Conclusion: Draw conclusions.
- o Reference list/bibliography: Provide a reference list or an annotated 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%: Written Exam (closed book)
- 20%: Skills assessment
- 40%: Assignment

UNESCO-IHE - MSc Module 2011/2013-WCM06: Negotiation and Mediation for Water Conflict Management (II)											
Nr	Course/Topic	lecture	exercise	workshop	labwork	fieldwork	fieldtrip	selfstudy	contact hours	studyload hours	Lecturer(s)
1	Introduction	2							2	6	Lena Salame and Pieter van der Zaag
2	Mediation techniques applied to water issues	6	12						18	30	Jonathan Kowarsky
3	Design and implement conflict resolution processes	12	20						32	56	Aaron Wolf
4	Summary of concepts	2							2	6	L. Salame and P. van der Zaag
5	Cases of transboundary water conflicts or cooperation		6						6	6	Joyeeta Gupta; invited guest lecturers
6	Final roleplay		12						12	12	Johan Kuylenstierna
	Essay			2					2	26	L. Salame; P. van der Zaag
	Exam									3	
Total		22	50	2				22	74	145	

WATER MANAGEMENT

MASTERS PROGRAMME

Academic Year: 2011-2013
Specialization: Core Programme
Module Coordinator: Klaas Schwartz and Rhodante Ahlers

Module Sheet

Module Name Institutional Analysis		Module Code WSM06	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 Preferably a relevant bachelor's degree or equivalent; basic PC-computer knowledge (MS-Windows, MS-Office); good English command.		

Learning Objectives

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

- Analyze the role of institutions in water management.
- Summarize different approaches to institutional analysis linked to different schools of thought.
- Apply these approaches for analyzing cases of water management.

Topics and Learning Activities

Introduction to the Module.

Approaches to Institutional Analysis.

Institutional Isomorphism.

Gender.

Formality and Informality.

Lecturing Material

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

Assessment

- **70%: Written Exam (open book)**
- **30%: Assignment**

UNESCO-IHE - MSc Module 2011/2013-WSM06: Institutional Analysis

Nr	Course/Topic	lecture	exercise	workshop	labwork	fieldwork	fieldtrip	selfstudy	contact hours	study/load hours	Lecturer(s)
1	Introduction to the Module	1									Schwartz/Ahlers
2	Institutional Analysis	3		4							Ahlers
3	Institutional Bricolage	3									Guest Lecturer
4	Formality and Informality	3		4							Schwartz
5	Gender	3									Joshi
6	Legal Pluralism	3									Kemerink
7	Case Erosian in Ethiopia	3									Smit
8	Case Water User Association in Malawi	3									Rusca
	Introduction to Assignment	1									Schwartz
	Assignment		50								
Total		23	50	8							

ENVIRONMENTAL SCIENCE

MASTERS PROGRAMME

Academic Year: 2011-2013
Specialization: ES-EPM, ES-WQM, WM-WQM
Module Coordinator: Masoom Hamdard

Module Sheet

Module Name Environmental Planning and Implementation (= ES07MW)		Module Code WQM07	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

Environmental Assessments (EIA/SEA)

Environmental Economics

Environmental Policy Enforcement

Lecturing Material

- Lecture Notes
- Additional Reading Materials
- Lecture powerpoint slides

Assessment

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

UNESCO-IHE - MSc Module 2011/2013-WQM07: Environmental Planning and Implementation (= ES07MW)

Nr	Course/Topic	lecture	exercise	workshop	labwork	fieldwork	fieldtrip	selfstudy	contact hours	study/load hours	Lecturer(s)
1	Sustainable Development	6	8						14	26	Hoekstra
2	Environmental Planning	2							2	6	Hamdard
3	Environmental Economics	14							14	42	Bijlsma
4	Environmental Assessment (EIA/SEA)	10	8						18	38	Vis, Clouting, Hamdard
5	Environmental Policy Enforcement	5	6						12	21	Douven, Guest lecturer
6	Fieldtrip								6	6	Hamdard
7	Exam									3	
Total		37	22					6	66	142	

WATER MANAGEMENT

MASTERS PROGRAMME

Academic Year: 2011-2013
 Specialization: Core Programme
 Module Coordinator: I. Masih

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..

- Evaluate, participate in and guide integrated water resources planning activities in a participatory context, and apply planning techniques and water resources system analysis methodologies such as modelling and decision support systems, stakeholder integration and methods for environmental impact assessment.

Topics and Learning Activities

Framework of Analysis for water Resources Planning:

Principles of integrated water resources planning. Planning scales and approaches. Comprehension of different frameworks used in water resources planning with focus on key steps in the planning process, such as situation and function analysis including multi-level water sector analysis, planning objectives and criteria, scenario and strategy development, role of modelling in water resources planning and multi-criteria analysis.

Learning Activities:

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

There will be a field trip to a relevant Institution in the field of water resources planning.

Stakeholder Participation in Water Resources Planning:

Importance of stakeholder participation in the planning process, opportunities and limitations. Stakeholder analysis. 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. Plan implementation and evaluation. 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).

Environmental Assessment:

Environmental impacts of water resources development projects, principles and methods of environmental impact assessment, Applications of environmental impact assessment (EIA) and strategic environmental assessment (SEA) in water resources/environmental planning and management.

Learning Activities:

The learning activities include lectures, exercises and assignments and group discussions.

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.
- J.C. Heun and N. Van Cauwenbergh – Participatory Integrated Water Resources Planning: Framework for Analysis and Stakeholder integration, UNESCO-IHE Lecture Notes.
- L. C. Beevers and H. Clouting - Environmental Assessment: Environmental Impact Assessment (EIA) & Strategic Environmental Assessment (SEA), UNESCO-IHE Lecture Notes.
- Other Handouts: Examples of case studies, Selected background reading.
- Software: LIBRA River Basin Planning Simulation, Excel Spreadsheets, Altaguax DSS, Expert Choice (MCA).

Assessment

- 55%: Written Exam (closed book)
- 45%: Assignment

UNESCO-IHE - MSc Module 2011/2013-WRM07: Water Resources Planning											
Nr	Course/Topic	lecture	exercise	workshop	labwork	fieldwork	fieldtrip	selfstudy	contact hours	studyload hours	Lecturer(s)
1	Introduction to Water Resources Planning (WRP)	2							2	6	I. Masih
2	Framework of Analysis for WRP	9	5	4					18	36	J.C. Heun and I.Masih
3	Stakeholder Participation in WRP	10	6	4					20	40	N. van Cauwenbergh
4	Environmental Impact Assessment and Strategic Environmental Assessment	14		6					20	48	H. Clouting and M. Vis
5	Field Trip						8	8	8	8	Hofstra
	Exam									3	
Total		35	11	14			8		68	141	

WATER MANAGEMENT

MASTERS PROGRAMME

Academic Year: 2011-2013
Specialization: Core Programme
Module Coordinator: S. Mugisha, PhD /P.J.M. Libaudiere, MSc

Module Sheet

Module Name		Module Code	Credits
Financial Management in the Water Sector		WSM07	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 the components of standard financial statements in water organisations.
- Analyze the financial position of a water organisation through an analysis of financial statements.
- Undertake a Cost-Benefit Analysis for water projects.
- Apply simple financial and economic modelling to optimize production and improve financial performance.
- Demonstrate demand assessments and explain the fundamentals of water pricing.
- Understand basic customer protection and marketing techniques in water organisations.

Topics and Learning Activities

1. Introduction to Financial Management.
2. Finance and accounts management.
3. Demand assessment, water pricing and cost recovery.
4. Cost-Benefit Analysis.
5. Services marketing and customer protection issues.
6. Economic and financial modelling techniques.
7. Financial operations management, group exercise.

Lecturing Material

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

Assessment

- 60%: Written Exam (open book)
- 10%: Assignment
- 20%: Assignment
- 10%: Assignment

UNESCO-IHE - MSc Module 2011/2013-WSM07: Financial Management in the Water Sector

Nr	Course/Topic	lecture	exercise	workshop	labwork	fieldwork	fieldtrip	selfstudy	contact hours	study/load hours	Lecturer(s)
1	Introduction to Financial Management	2							2	4	S. Mugisha
2	Finance and accounts management	12	4						16	34	Ms. Fernandez Alvarez
3	Demand assessment, water pricing and cost recovery	12	4						16	34	Prof. M.P. van Dijk
4	Cost-Benefit Analysis	8	8						16	34	S. Mugisha/ P. Libaudiere
5	Services marketing and customer protection issues	4							4	8	S. Mugisha
6	Economic and financial modelling techniques	4							4	8	S. Mugisha
7	Financial operations management, group exercise	2	6						8	18	S. Mugisha/ P. Libaudiere
Total		44	22						66	140	

WATER MANAGEMENT

MASTERS PROGRAMME

Academic Year: 2011-2013

Specialization: Core Programme

Module Coordinator: Prof. P. van der Zaag, PhD, MSc /J.Kemerink, MSc

Module Sheet

Module Name Water and Environmental Law		Module Code WM08	Credits 5
Target Group Young and mid-career professionals and middle level decision-makers dealing with water management.	Prerequisites Preferably a relevant water science and engineering related bachelor's degree or equivalent; affinity with water management; good command of English.		

Learning Objectives

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

- To describe and understand the fundamentals of national and international water and environmental law and legislation.
- To perceive and apply accepted and desired legal and institutional arrangements for applying principles of Integrated Water Resources and Environmental Management.
- To describe and apply legal instruments for the application of IWRM with the emphasis on functional decentralization, river basin organizations, planning and decision-making through water allocation criteria, systems of water rights, water (effluent) permit systems etc.
- To perceive and appraise concepts of customary water rights.
- To get insight in to processes of international water allocation.
- To explain the concept of multi-level governance and the relationship between national and international legal and policy systems and to be able to persuasively argue a case for international water conflict resolution.

Topics and Learning Activities

Introduction to national and international water law and institutions

Comparative environmental law and water law principles. Innovative legal and policy instruments; changing patterns of global governance. Introduction to the UN system. Introduction to the Law of Treaties. Key international environmental and water treaties. Principles of dispute resolution.

Processes of water policy development

Water sector reform, functional decentralization and development and benchmarking of river basin organizations.

Systems of (transboundary) water allocation and (customary) water rights

Shared vision and strategy development, water and benefit sharing from international rivers.

Regulations for international and trans-boundary water quality management

EU Framework Directive, Dutch water policy and organizations, application of environmental standards and others.

Lecturing Material

- F.G.W. Jaspers- Legal Arrangements for Water Governance, UNESCO-IHE Lecture Notes.
- F.G.W. Jaspers- Role Play International Rivers, UNESCO-IHE Lecture Note.
- F.G.W. Jaspers- Introduction in Contract Management, UNESCO-IHE Lecture Note.
- J. Gupta- International Water Law and Institutions, UNESCO-IHE Lecture Note.
- P. van der Zaag e.a- Legislation of International Waters, UNESCO-IHE Lecture Note.
- Various inputs from guest lecturers.

Assessment

- **100%: Written Exam (closed book)**

UNESCO-IHE - MSc Module 2011/2013-WM08: Water and Environmental Law

Nr	Course/Topic	lecture	exercise	workshop	labwork	fieldwork	fieldtrip	selfstudy	contact hours	study/load hours	Lecturer(s)
1	Water Law								32	76	
1.1	Introduction to Water Law	2									Jaspers
1.2	Conflict Resolution			4							Gupta
1.3	International Environmental Law	12									Gupta
1.4	Contract Management	4		2							Jaspers
1.5	Regulations Water Quality Management	4									Hendry
1.6	EU Water Framework Directive			4							Hendry
2	Legal Arrangements								24	64	
2.1	River Basin Organization (Intro)	4		4							Jaspers
2.2	Legal Instruments	4									Jaspers
2.3	Water Rights and Allocation	4									Jaspers
2.4	International Water Sharing	4									van der Zaag
2.5	Customary Water Rights	4									van der Zaag
3	Role Play International Rivers			6					6	6	Jaspers
4	Electives* (may not be offered every year)										
4.1	Workshop Sector Reform			6							Jaspers
4.2	Case Studies			4							To be announced
5	Fieldtrip										Jaspers
	Exam									3	
Total		42		30					62	149	

WATER MANAGEMENT

MASTERS PROGRAMME

Academic Year: 2011-2013
Specialization: Core Programme
Module Coordinator: S. Graas and N. Van Cauwenbergh

Module Sheet

Module Name International fieldwork		Module Code WM09	Credits 5
Target Group This module is required for all participants in the Water Management programme. Participants of the WQM specialisation may choose to participate in the fieldtrip of the Environmental Science. In this case, they will also follow the Environmental Science Groupwork.	Prerequisites Bachelor's degree. Basic computer skills (MS-Windows, Office) Good English command. Basic knowledge of IWRM and EU FWD.		

Learning Objectives

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

- Compare the different water management perspectives and uses in practice in Spain and Portugal. Issues that will be elaborated upon during the fieldwork include Multiple uses for and multiple sources of water; Up and downstream water issues; Institutional framework and implementation of the EU WFD; Public and private water supply; Conventional and alternative waste water treatment and reuse; Large Dams and transboundary river basin issues; Ancient irrigation and water supply systems; Non conventional water resources: desalination and wastewater reuse; Formal and informal decision making processes.
- Formulate a problem statement
- Collect and analyse data from field measurements and interviews
- Develop a problem analysis

Topics and Learning Activities

Problem analysis of Andarax basin

The fieldwork in the Andarax basin is linked with the Water Management groupwork in August. As such, the fieldwork fulfills a double role. Students are asked to develop a clear problem analysis for a given water management theme in the Andarax basin. This problem analysis feeds into the groupwork where an integrated management plan for the Andarax basin will be developed.

Prior to going to the Andarax basin, participants will prepare for the fieldwork through literature review, lectures and discussion. On the basis of these activities, the group will formulate research questions and methodology to accomplish a thorough problem analysis. During the fieldwork in the Andarax basin, data will be collected during the visits to various institutions and stakeholder groups. This means that participants have to ask questions, ask for data, collect information, etc., that will be used for the problem analysis.

Guadiana - Large infrastructure and transboundary issues

The visits in the Guadiana basin focus on the issues related to transboundary water management and the design, implementation and governance of large dams. Both Spanish and Portuguese water managers will comment on the established (or absence of) collaboration on management of quantity and quality of water flowing across the Spanish/Portuguese border. Negotiation and conflict resolution in place will be discussed with experts. Authorities and stakeholders will comment on technical, socio-economic and governance issues of the dam and its relation to upstream and downstream development.

Lecturing Material

Assessment

- 50%: Presentation
- 50%: Skills assessment

UNESCO-IHE - MSc Module 2011/2013-WM09: International fieldwork

Nr	Course/Topic	lecture	exercise	workshop	labwork	fieldwork	fieldtrip	selfstudy	contact hours	study/load hours	Lecturer(s)
	International fieldwork					60	80	80		140	Various
	Total					60	80			140	

ENVIRONMENTAL SCIENCE

MASTERS PROGRAMME

Academic Year: 2011-2013
Specialization: Core Programme
Module Coordinator: G.M. Gettel, PhD, MSc

Module Sheet

Module Name Aquatic Ecosystems (SEE MODULE: ES10TW)		Module Code WQM10	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 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
- 10%: Assignment
- 10%: Presentation

UNESCO-IHE - MSc Module 2011/2013-WQM10: Aquatic Ecosystems (SEE MODULE: ES10TW)

Nr	Course/Topic	lecture	exercise	workshop	labwork	fieldwork	fieldtrip	selfstudy	contact hours	study/load hours	Lecturer(s)
	Lecture	14							14	42	Gettel, de Ruyter, Irvine
	Laboratory work				12				12	12	Gettel, de Ruyter, Irvine
	In-class (data-analysis, groupwork)			44					44	64	Gettel, de Ruyter, Irvine
	Paper writing		11						11	22	Gettel, de Ruyter, Irvine
	Total	14	11	44	12			11	81	140	

WATER MANAGEMENT

MASTERS PROGRAMME

Academic Year: 2011-2013
 Specialization: Core Programme
 Module Coordinator: Y.A. Mohamed, PhD, MSc

Module Sheet

Module Name Advanced Water Systems Modelling		Module Code WRM10	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 Successful completion of WM102, WR201 and Geo-Information Management 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..

- Analyze the properties of stochastic processes including rainfall-runoff processes.
- Generate artificial sequences of hydrologic data from various sources of information.
- Present the most common optimization techniques used in water resources management: Lagrange multipliers; Dynamic programming; Linear programming.
- Understand basic principles of GIS and RS data as linked to hydrological and water management applications.
- Conduct catchment water balance using RS data.
- Compute water accounting for a catchment and derive water accounting indicators relying on RS data.

Topics and Learning Activities

Modelling uncertainty

Introduction to stochastic processes in hydrology.

Learning Activities:

Markov processes and Markov chains. Hydrologic time series modelling and analysis: properties of times series, ARMA modelling.

Optimization

Linear and dynamic programming in water resources management.

Learning Activities:

Illustrated with a real case study??

Water balance with RS data

Introduction to RS data and satellite imagery.

Learning Activities:

Processing of RS data to derive water balance components: precipitation, evaporation and runoff. Catchment water balance in GIS environment. Illustrated with a real case study??

Water accounting

Water accounting techniques as a tool for water resources management.

Learning Activities:

Computation of water accounting indicators (water supply, water consumption, and water productivity) at a river basin scale.

Lecturing Material

- Loucks, D., and E. van Beek (2005), Water resources systems planning and management, UNESCO Publishing, Paris, France.
- Other handouts: Examples of case studies, selected background readings.
- Software: MATLAB. ArcGIS, ILWIS.

Assessment

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

UNESCO-IHE - MSc Module 2011/2013-WRM10: Advanced Water Systems Modelling

Nr	Course/Topic	lecture	exercise	workshop	labwork	fieldwork	fieldtrip	selfstudy	contact hours	study/load hours	Lecturer(s)
1	Optimization in WRM(Lagrange multipliers, dynamic and linear programming)								22	44	Tiltman and Brower
1.1	Lagrange multipliers	2	2								
1.2	Dynamic programming	4	4	2							
1.3	Linear programming	4	2	2							
2	Water accounting using RS data								38	94	
2.1	Advances in Hydrological Sciences	4									Mohamed Savenije and Bastiaanssen
2.2	Introduction to Remote Sensing and satellite imagery	2									
2.3	Raster image processing	2		4							
2.4	Catchment delineation	4		4							
2.5	Derivation of water balance components	2		4							
2.6	Computation of catchment water balance	2		4							
2.7	catchment water accounting	2		4							
3	Exam								3	3	
	Total	28	8	24					63	141	

WATER MANAGEMENT

MASTERS PROGRAMME

Academic Year: 2011-2013
Specialization: Core Programme
Module Coordinator: M.W. Blokland, MSc

Module Sheet

Module Name Managing Water Organisations		Module Code WSM10	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..

- Understand the position and strategy of a water organisation in relation to its institutional environment.
- Identify the main factors that shape and structure water organisations. Understand the scope and scale of operations of a water organisation.
- Understand the management and decision-making processes in water organisations, including the management of change and the need to respond to emerging challenges.
- Understand the key work processes in water organisations.
- Understand the use of performance analysis and benchmarking in the regulation and management of water organisations.
- Understand the processes of human resources management, health and safety management, 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

UNESCO-IHE - MSc Module 2011/2013-WSM10: Managing Water Organisations

Nr	Course/Topic	lecture	exercise	workshop	labwork	fieldwork	fieldtrip	selfstudy	contact hours	study/load hours	Lecturer(s)
1	Introduction									16	
1.1	Course and Fieldtrip Introductions	2							2		Blokland
1.2	Managing a Water Utility	4		2					6		Veldkamp
2	Water Organisations in Context									17	
2.1	Organisations Undergoing Reform	2		2					4		Schwartz
2.2	Mandate and Structure of RBO's	4		2					6		Mostert
2.3	Environment and Strategy	4		2					6		Schouten
2.4	Scale and Scope of Operations	4		2					6		Jaspers
3	Water Organisations at Work									17	
3.1	Effective Organisations	4		2					6		Schuermans
3.2	Performance and Benchmarking	6		4					10		Blokland
3.3	Integrity, Sustainability	4		2					6		Labre, Perianu
3.4	Health and Safety	4		2					6		Harle
3.5	Asset Management	4		2					6		van Dijk
3.6	Customer Management	4		2					6		Beltman
3.7	Human Resources Management	2		2					4		van Heijzen
4	Fieldtrip						8	8	8	8	Water Board HHNK
5	Assignment									82	
	Total	48		26			8	8	82	140	

WATER MANAGEMENT

MASTERS PROGRAMME

Academic Year: 2011-2013

Specialization: Water Resources Management & Water Quality Management

Module Coordinator: Marloes Mul and Masoom Hamdard

Module Sheet

Module Name Watershed and River Basin Management (= ES11MW)		Module Code WQM11	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 and assess 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
- Familiarize the student with the watershed planning and management approaches, specifically in terms of soil and water management
- Explain temporal and spatial scales issues in hydrology
- Familiarize the student with economic instruments used for water management at watershed and river basin scales

Topics and Learning Activities

Introduction to river basin and watershed management

Soil and water management in agriculture

Water and ecosystems

Watershed economics

Watershed planning and management approaches

Role play- ShaRiva

Lecturing Material

- Lecture Notes
- Role play reading materials
- Lecture powerpoint slides
- Additional reading materials

Assessment

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

UNESCO-IHE - MSc Module 2011/2013-WQM11: Watershed and River Basin Management (= ES11MW)

Nr	Course/Topic	lecture	exercise	workshop	labwork	fieldwork	fieldtrip	selfstudy	contact hours	study/load hours	Lecturer(s)
1	Introduction	2							2	4	Mul/Hamdard
2	Biophysical processes and anthropogenic interactions								12	40	
2.1	Soil & Water Management	4	4								Van der Zaag
2.2	Watershed hydrology and human interventions	4									Mul
2.3	Environmental flow allocation	4									McClain
3	Watershed and river basin planning								12	36	
3.1	Planning processes	2									Douven
3.2	Technical tools to support planning processes	2									Mohamed
3.3	Participatory tools to support planning processes	2									Kemerink
3.4	Watershed economics	6									Hellegers (WUR)
4	Watershed and river basin management								16	48	
4.1	Institutional aspects in watershed and river basin management	4									Leentvaar
4.2	Agreements and Frameworks for transboundary cooperation	4									Leentvaar
4.3	Transboundary Interdependencies	4									Hamdard
4.4	Implementation of national policies at watershed scale	4									Mul
5	Role-Play SHA-RIVA		20						20	20	Mul & Hamdard
6	Field trip						4	4	4	4	Mul & Hamdard
7	Exam									3	
Total		42	24				4		66	155	

WATER MANAGEMENT

MASTERS PROGRAMME

Academic Year: 2011-2013
Specialization: Core Programme
Module Coordinator: P.J.M. Libaudière, MSc

Module Sheet

Module Name Public-Private Partnerships		Module Code WSM11	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.

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 (closed book)**
- **30%: Assignment**

UNESCO-IHE - MSc Module 2011/2013-WSM11: Public-Private Partnerships

Nr	Course/Topic	lecture	exercise	workshop	labwork	fieldwork	fieldtrip	selfstudy	contact hours	study/load hours	Lecturer(s)
1	Introduction										
1.1	Introduction to the course	1							1	2	Prof. M. P. van Dijk
1.2	Introduction to PPPs	4							4	12	Prof. M. P. van Dijk
1.3	Case study presentations	3							3	8	Prof. M. P. van Dijk
2	Principles of PPPs										
2.1	PPP options	2							2	6	Prof. M. P. van Dijk
2.2	PPP environment	4							4	12	Prof. M. P. van Dijk
2.3	PPP economics	2							2	6	Prof. M. P. van Dijk
2.4	Tutorials		4						4	12	Prof. M. P. van Dijk
3	PPP in practice										
3.1	Current situation and actors	4							4	8	To be announced
3.2	Contracts	4							4	12	To be announced
3.3	Risks and limitations	2							2	6	To be announced
3.4	Success factors of PPPs	2							2	8	To be announced
3.5	Case study exercises		4						4		To be announced
3.6	Real life examples	4							4	12	To be announced
4	Issues regarding PPPs										
4.1	Best practices	4							4	12	Prof. M. P. van Dijk
4.2	Controversies in the water sector	6							6	12	Prof. M. P. van Dijk
4.3	Pro-poor approaches	4							4	8	Prof. M. P. van Dijk
4.4	Trends in the water sector	2							2	8	Prof. M. P. van Dijk
5	Fieldtrip: Harnasch polder / Delfluent services						4	4	4		To be announced
6	Mini Symposium	4							4	2	Prof. M. P. van Dijk; J. Labre
Total		52	8				4		64	146	

WATER MANAGEMENT

MASTERS PROGRAMME

Academic Year: 2011-2013
Specialization: Core Programme
Module Coordinator: Klaas Schwartz and Susan Graas

Module Sheet

Module Name Group Work WM		Module Code WM12	Credits 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

Assessment

- 65%: Assignment
- 35%: Assignment

UNESCO-IHE - MSc Module 2011/2013-WM12: Group Work WM

Nr	Course/Topic	lecture	exercise	workshop	labwork	fieldwork	fieldtrip	selfstudy	contact hours	study/load hours	Lecturer(s)
1	Introduction Groupwork	1									Schwartz and Graas
2	Presentations thematic groups			2							Various
3	Introduction Integrated Groups	1									Schwartz and Graas
4	Draft Presentations Integrated Groups			2							Various
5	Groupwork	130									
6	Final Presentations Integrated Groups			4							Various
Total		2130		8							

WATER MANAGEMENT

MASTERS PROGRAMME

Academic Year: 2011-2013
Specialization: Core Programme
Module Coordinator: Klaas Schwartz

Module Sheet

Module Name		Module Code	Credits
Research and academic skills development		WM13	0
Target Group	Prerequisites		
All participants of the WM programme			

Learning Objectives

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

- Explain what science is and what scientific research entails
- Design and plan a scientific research project
- Collect and analyse data scientifically
- Explain and present the results of the research scientifically
- Evaluate and give feedback about other research projects

Topics and Learning Activities

Research methodology

What is science? research methodology, critical reading, annotated bibliography and literature review problem analysis and problem framing, designing of research questions, development of hypotheses, formulating a research design, survey design and implementation, interview techniques, data analysis, methodology for modellers, methodology for laboratory work, essay writing.

Lecturing Material

Assessment

- 100%: Integrated in modules

UNESCO-IHE - MSc Module 2011/2013-WM13: Research and academic skills development

Nr	Course/Topic	lecture	exercise	workshop	labwork	fieldwork	fieldtrip	selfstudy	contact hours	study/load hours	Lecturer(s)
	Introduction to Research Methodology for the Social Sciences	1								3	Schwartz
	Conceptual framework	2								6	Rusca
	Introduction to Cluster Meetings			2						2	Kemerink
	Interview Techniques and Participant Observation	2								6	Kemerink
	Frequently Made Mistakes			3						3	Ahlers
	Data Analysis			4						4	Schwartz
	Research Exercise		30							30	Ahlers/Schwartz
	Proposal Design	1								3	Schwartz
	Case Study Methodology	3								9	Schwartz
	Survey Design	4								12	Van Dijk
	Survey Analysis	4								12	Van Dijk
	Total	17	30	9						90	

WATER MANAGEMENT

MASTERS PROGRAMME

Academic Year: 2011-2013
 Specialization: Core Programme
 Module Coordinator: Klaas Schwartz / E.A. de Jong, MA

Module Sheet

Module Name		Module Code	Credits
Summer courses / MSc research proposal development		WM14	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**

UNESCO-IHE - MSc Module 2011/2013-WM14: Summer courses / MSc research proposal development

Nr	Course/Topic	lecture	exercise	workshop	labwork	fieldwork	fieldtrip	selfstudy	contact hours	study/load hours	Lecturer(s)
1	MSc research proposal drafting										
2	MSC research proposal presentation										Mentor and professor
Total								1			

WATER MANAGEMENT

MASTERS PROGRAMME

Academic Year: 2011-2013
 Specialization: Core Programme
 Module Coordinator: Klaas Schwartz

Module Sheet

Module Name MSc research		Module Code WM15	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

UNESCO-IHE - MSc Module 2011/2013-WM15: MSc research											
Nr	Course/Topic	lecture	exercise	workshop	labwork	fieldwork	fieldtrip	selfstudy	contact hours	studyload hours	Lecturer(s)
1	MSc Research									1008	
Total										1008	