

EDUCATION AND TRAINING GUIDE

MSc PROGRAMMES | PhD PROGRAMME
ONLINE & SHORT COURSES
TAILOR-MADE TRAINING



2011

NEW
JOINT PROGRAMMES
Including Double Degree &
Erasmus Mundus



UNESCO-IHE
Institute for Water Education





SMART SOLUTIONS FOR WORLDWIDE WATER CHALLENGES

UNESCO-IHE offers a wide range of flexible, high quality, specialised educational solutions to respond to the needs of diverse clients from the professional water arena.



RECTOR'S STATEMENT

The need for a more integrated approach to water and environmental resources management calls for professionals with a high degree of specialisation, as well as generalists equipped to lead and manage multidisciplinary efforts, individuals and organisations in the water and environment sectors world-wide. UNESCO-IHE educates professionals to increase their expertise, while gaining insight into the international water arena – making contacts with fellow professionals from around the globe.

UNESCO-IHE is making efforts to make water education more accessible and affordable for increasing numbers of students, by making its education more flexible. The Institute has made significant investments in developing and conducting educational activities in collaboration with partner institutes. An added bonus of collaboration is that it allows for the capacity of water education to be further developed worldwide.

UNESCO-IHE trained professionals have access to and are part of a global partnership network, consisting of alumni, guest lecturers, experts and renowned centres of knowledge, together providing a vast source of expertise to draw upon. Since its establishment in 1957, the Institute has trained 14,500 scientists, engineers and decision-makers representing more than 160 countries. Alumni reach senior positions in their home countries and become nationally and internationally recognised experts in their fields of speciality.

I hope to welcome you as a member UNESCO-IHE's growing network of professionals,

Professor András Szöllösi-Nagy, Rector

FLEXIBILITY

UNESCO-IHE is making efforts to make water education more accessible and affordable for increasing numbers of students. One way the Institute achieves this is increasing the flexibility of educational programmes. Within the MSc programmes, a student can pick and choose courses to match their training needs and interests; UNESCO-IHE staff members will ensure that a full MSc level is maintained, taking into account the student's personal wishes.

Flexibility is also achieved by providing increasing numbers of online courses, short courses, and joint programmes. It is possible to earn and collect ECTS credit points for both short and online courses. In addition, many programmes are offered jointly with other academic institutes, decreasing the amount of time that students have to spend away from home.

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WELCOME TO UNESCO-IHE



Studying at this institute afforded me the opportunity to meet people of diverse culture and minds.

I will miss the hospitable people of Delft."

Clement Ataguba, Nigeria

DELFT

Delft is a city of great charm, and UNESCO-IHE is located in its 17th century historical city centre. It has tree lined canals, beautifully kept monuments, historic squares - some with terraces, quaint shops and art galleries. It is also the city of the famous Delft Blue ceramics, the renown painter Vermeer, and has close historical ties to the Royal House of Orange.

Since Delft is a university city, there are plenty of cultural events to be enjoyed throughout the year, as well as museums and theaters. There is also an abundance of cafés and restaurants, catering to every taste and making time spent away from your studies an experience within itself.

Water has always played an important role in Delft's history and continues to do so today. Therefore, it is no surprise that many water engineering and technology related organisations have chosen Delft as their home base. UNESCO-IHE maintains close working relationships to various Delft-based research and education institutes, the Delfland Water Board, the municipality of Delft, and many Delft-based and Dutch water initiatives.

Delft is well connected to the Dutch public transport system, making The Hague, Rotterdam, Schiphol International Airport and Amsterdam easily accessible. It is a great location from which to explore other places of interest, both within the Netherlands and throughout Europe.

YOUR INTERNATIONAL EXPERIENCE

Staff at the Institute simplify your transition to the Netherlands by organising the annual 'Introduction Days.' In these two weeks, they help you deal with various formalities such as residence permits, health insurance and bank accounts. Other activities during this period are an excellent way for new students to meet one another and receive the friendship and advice of senior students and the Institute's staff. During your stay in Delft, you will form lifelong friendships and professional relationships.

Throughout your study period, UNESCO-IHE organises many social, cultural and sports events, allowing you to get the most out of your free time. Every year, trips are organised that stimulate you to discover Dutch culture, Delft, the Netherlands and Europe.

Delft is a university city, and therefore accommodation is scarce and expensive. This is why UNESCO-IHE provides fully furnished accommodation in Delft for all students of the Institute's programmes, available upon arrival and for the duration of the study period.



FELLOWSHIP OPPORTUNITIES

Candidates seeking financial assistance to cover all or part of their studies in one of the UNESCO-IHE programmes or courses, please see the fellowship opportunities on our website: www.unesco-ihe.org/fellowships. Candidates from NFP countries are always encouraged to apply for an NFP fellowship, besides any other sponsoring they may be pursuing.

MEET THE DUTCH

UNESCO-IHE has a unique 'Meet the Dutch' programme which stimulates the exchange of cultures. This volunteer programme matches participants studying at the Institute to the local inhabitants of Delft and its surroundings. During their stay in the Netherlands, the participants meet up with their 'host family' on a regular basis, tasting the Dutch culture and festivities from a family perspective.

The exchange works both ways: the host family is also invited to join the participant in festivities at - for example - UNESCO-IHE or at their home. Often, the contacts between the host families and participants continue for many years, even after the participant leaves the Netherlands.



THE INSTITUTE'S FACILITIES AND SERVICES

- 14,000 m² premises, including three interconnected buildings;
- Four modern teaching and research laboratories - aquatic ecology, microbiology process and analytical laboratories - including state of the art instrumentation;
- A library with online connections to national and international recourse centres, and a reading room containing many international journals and magazines;



- Modernised classrooms and multi-functional lecture theatres;
- A fully equipped auditorium seating 300 and a videoconferencing studio;
- Notebooks for all participants and extensive computing facilities;
- Flexible and group workspaces, notebooks lockers,
- A restaurant offering a wide variety of meals and snacks;
- Social and cultural activities, sports facilities and events;
- International student health and counselling services;
- An in-house prayer room.

"We are a family,
we are UNESCO-IHE!"

Maybin Mğambi, Malawi



UNESCO-IHE A NETWORK FOR LIFE



Certainly it is UNESCO-IHE that gave me the technical background to assume my new duties as Water Minister of my country. It was a great honour for me that the day I took my oath to be able to say that I am a UNESCO-IHE Alumnus! I will do my best to make IHE proud of me, and to use this position for the good of my people, especially those in need."

Luis Angel Montenegro, Nicaragua

Today, several Ministers and Deputy Ministers, heads of international organisations, and top professors and scientists around the globe are UNESCO-IHE graduates.



MAKE UNESCO-IHE YOUR NETWORK

UNESCO-IHE is at the centre of a vast international network of water related institutions, and functions as an interface between knowledge networks and centres, public and private sector organisations, scientific and professional associations and other members of the international water community. These partnerships are of vital importance in terms of access and sharing of information. Through these partnerships, the Institute broadens its knowledge base and increases its effectiveness in responding to the demand for its services. UNESCO-IHE works in close cooperation with UNESCO programmes and institutes, as well as various United Nations agencies.

As a student, you profit from the professional contacts the Institute has made during its half a century of existence. When studying at UNESCO-IHE, you can expect to meet leading figures from the international water arena. Your professors and lecturers will put your study in the perspective of global dialogues and targets such as the Millennium Development Goals. The Institute's approach applies an international perspective to solve domestic problems: think globally, act locally.

During your studies at UNESCO-IHE you will meet fellow students from around the globe. Their cultures and professional experiences will allow you to taste the Institute's network on a more personal level. Throughout the year the Institute hosts a number of social and cultural activities that aim to make your life as pleasant as possible. Also, excursions to other locations in the Netherlands and Europe are frequently arranged, on top of the curricular field trips organised within the framework of your study programme.



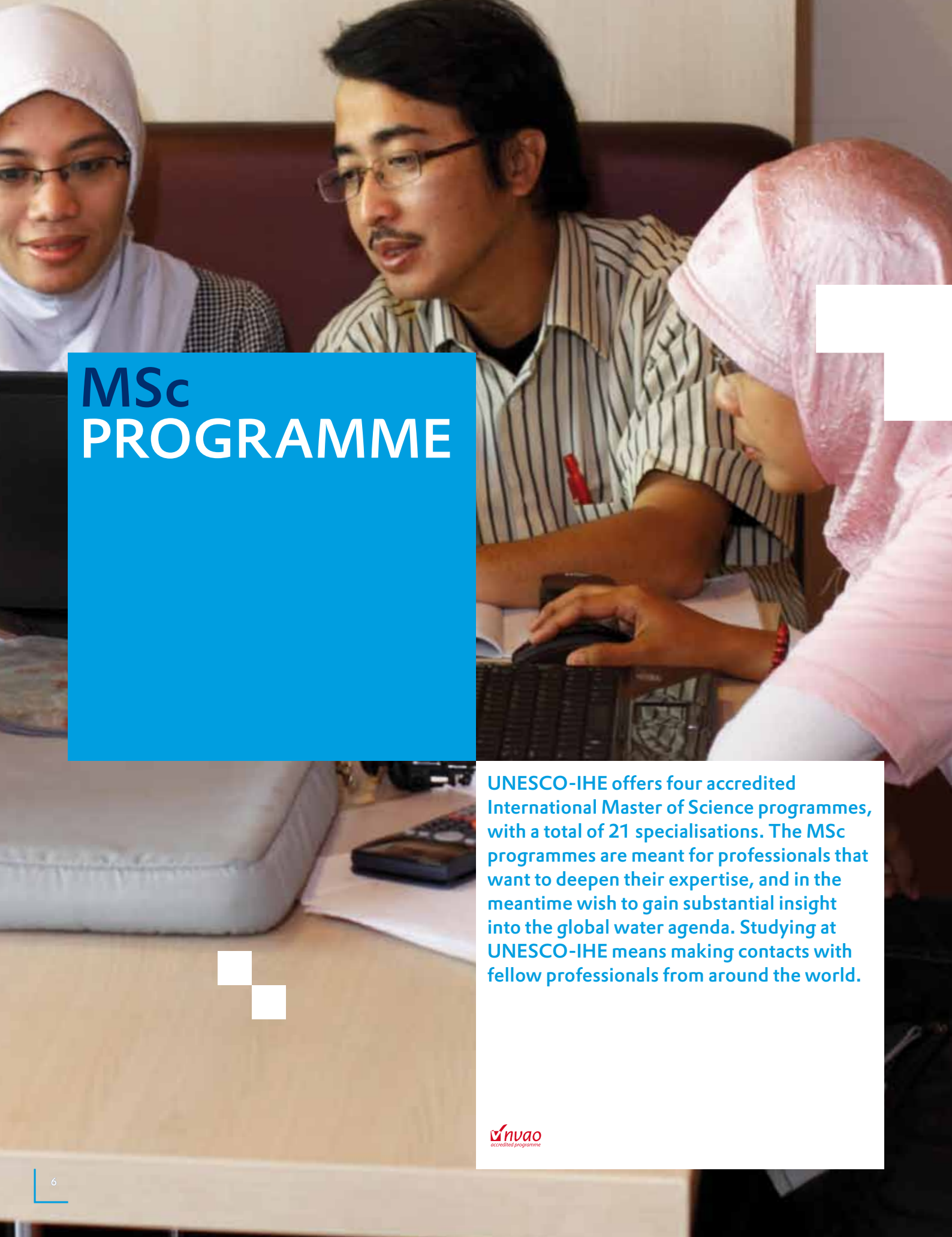
UNESCO-IHE ALUMNI COMMUNITY

After graduation, as an alumnus, you have access to and remain part of the largest global partnership network of water professionals in the world. This network also consists of guest lecturers, experts and renowned centres of knowledge, together providing a vast source of expertise to draw upon. UNESCO-IHE will continue to facilitate the communication between you, your former classmates, and the Institute. You will have lasting access to the alumni website to – among others – update your data, look for colleagues worldwide, access the Institute-produced theses, and share information. Also, you will receive news about the Institute and the water sector on a regular basis through e-newsletters and the bi-annual Update Magazine. Alumni are invited to join a Netherlands' Alumni Association in their country, independent associations where you can meet fellow alumni and enjoy social and professional activities.



With a UNESCO-IHE degree you will have made a major step in your professional career. Many alumni reach prominent positions in which strategic, managerial, policy and decision-making components become major responsibilities of their functions. You will - over time - wish to keep your

skills and knowledge up-to-date, to stay in tune with changing professional demands. To cater to this need, the Institutes refresher seminars are held annually in different continents, covering themes of direct relevance to these regions. Also, alumni are entitled to discounts on the tuition fee for attending UNESCO-IHE short and online courses, and purchasing publications.



MSc PROGRAMME

UNESCO-IHE offers four accredited International Master of Science programmes, with a total of 21 specialisations. The MSc programmes are meant for professionals that want to deepen their expertise, and in the meantime wish to gain substantial insight into the global water agenda. Studying at UNESCO-IHE means making contacts with fellow professionals from around the world.





JOINT PROGRAMMES

MSc specialisations developed with and offered in collaboration with renowned partner institutes – the so-called **joint programmes** **J** – have varying start and end dates, and part of the programme is not given at UNESCO-IHE, but rather at a partner institute, often in another country/continent.

Joint double degree programmes **Jdd** are joint programmes awarded with a partner's degree as well as the UNESCO-IHE degree. **Joint Erasmus Mundus programmes** **Jem** are joint programmes offered under the European Erasmus Mundus framework, and often entail multiple study locations.

New joint programmes are currently being developed, so for the latest developments regarding joint programmes, please visit our website.

MSc PROGRAMMES

In these programmes, a mix of modern knowledge transfer methods is used, including lectures, workshops, role-plays, video, internet, study tours, and field visits. Your professional vision will develop as you exchange knowledge in an international atmosphere, learning from best practices in various regions of the world. You are encouraged to develop an integrated approach in your work with the aim of achieving sustainable solutions, taking into account the multidisciplinary aspects of challenges you may encounter during your career. This means that the up-to-date knowledge you acquire during your studies will be directly applicable to solve current problems in your home countries. Special attention is paid to local conditions that will invariably influence your decision making process.

The **Delft-based MSc specialisations** **Db** start in October and take 18 months, of which the first year consists of taught modules that are given at UNESCO-IHE in Delft. After successful completion of the taught modules, the student does individual research for a six months. The research deals with a practical or theoretical problem and may be carried out in collaboration with an organisation outside the Netherlands, for example in the home country. Often, field data collection, laboratory or computer analysis work are part of the research. Research is always completed with a thesis and a public presentation of results.



MSc PROGRAMME IN ENVIRONMENTAL SCIENCE		
Environmental Planning and Management		Db
Environmental Science and Technology	Db	Jdd
Environmental Technology and Engineering		Jem
Limnology and Wetland Ecosystems		J
Water Quality Management		Db
MSc PROGRAMME IN WATER MANAGEMENT		
Water Conflict Management		J
Water Resources Management		Db
Water Services Management		Db
Water Quality Management		Db
MSc PROGRAMME IN MUNICIPAL WATER AND INFRASTRUCTURE		
Sanitary Engineering	Db	Jdd
Urban Water Engineering and Management		Jdd
Water Supply Engineering	Db	Jdd
MSc PROGRAMME IN WATER SCIENCE AND ENGINEERING		
Agricultural Water Management for Enhanced Land and Water Productivity		Jdd
Ecohydrology		Jem
Flood Risk Management		Jem
Hydraulic Engineering and River Basin Development		Db
Hydraulic Engineering - Coastal Engineering and Port Development	Db	J
Hydraulic Engineering - Land and Water Development		Db
Hydroinformatics - Modelling and Information Systems for Water Management	Db	J Jdd
Hydrology and Water Resources	Db	J
Integrated Lowland Development and Management Planning		J

ACADEMIC QUALITY AND ACCREDITATION

UNESCO-IHE MSc degrees are legally accredited, and students awarded this degree are eligible for admission to PhD programmes all over the world. UNESCO-IHE uses the European Credit Transfer System, in which each credit point is equivalent to 28 study load hours. The Delft-based UNESCO-IHE specialisations are 106 credit points in total.

The Institute's academic staff is composed of established international professors and lecturers. A pool of guest lecturers and partners from UNESCO-IHE's global network provide additional scientific expertise in the various areas of specialisation and bring in case studies in which the theory is brought into practice.





PhD PROGRAMME

The PhD Programme leads to a deepening of a field of specialisation. PhD fellows do scientific research, often with conclusions that directly influence their region. At UNESCO-IHE, more than 100 PhD researchers from around the world are brought together to participate in problem-focused and solution-oriented research on development issues, resulting in an inspiring research environment.



UNESCO-IHE is a member of the Research School for Socio-Economic and Natural Sciences of the Environment (SENSE). This Dutch research school focuses on both the natural sciences and socio-economic fields of environmental research. SENSE is accredited by the Royal Netherlands Academy of Sciences (KNAW), and brings together excellent academic research groups from nine universities and research centres.



Conducting research at UNESCO-IHE is a unique experience. You work together with other researchers – including over 100 PhD fellows and 200 MSc students from different countries – all dealing with topics related to water and the environment. This results in a vibrant,

multicultural and multidisciplinary research atmosphere. You participate in problem oriented research with relevance for development, by joining an existing research programme or by defining your own research topic within UNESCO-IHE's strategic themes. As a PhD fellow at the Institute, you benefit from the possibility of linking MSc research to your own.

Through your research, you address the global water agenda, and solve problems relevant to the water and environment sectors world-wide, as a contribution to the Millennium Development Goals and other mandates from the international community. You will often do so in collaboration with the Institute's vast network of research institutions throughout the world.

PhD research is often carried out in the 'sandwich' model. Preparation and final reporting – the first and last portion of the programme – are carried out in Delft, while actual research is done in the fellow's home country, under co-supervision of a local institute. Regular contacts with the promotor are maintained through visits and long-distance communication. This enables researchers to employ solutions directly to problems in their geographical region.

UNESCO-IHE's PhD degrees are awarded jointly with a university. The degrees are highly valued and fully recognised in all parts of the world. The nominal time span of a PhD programme is four years.



Themes & Research Lines

ENVIRONMENTAL INTEGRITY

Planning for integrated river basin management
Wetland management
Environmental water allocation
Cleaner production and the water cycle
Eco-technologies

INFORMATION AND COMMUNICATION SYSTEMS

Modelling paradigms, uncertainty and risk
Systems engineering and optimisation
Collaborative decision making and Internet-based computing and learning

URBANISATION

Water transport and distribution
Ground water treatment
Natural treatment systems
Conventional water treatment technology
Desalination & membrane related technology
Advanced nutrient removal processes
Activated sludge modeling
Resources-oriented sanitation
Membrane bio-reactors
Water/wastewater infrastructure asset management
Optimization of wastewater collection and treatment components
Integrated urban water infrastructure management

WATER MANAGEMENT AND GOVERNANCE

Institutional analysis and reform processes
Strengthening and developing organisations
Human resources development
Bio-physical processes (efficient use)
Institutional dimensions (good governance)
Integrative properties (sustainable systems)
Institutional options for water and sanitation
Establishment and functioning of river basin organisations
Organisational change in the water sector
Strategic management of drinking water utilities
Equity and participation issues in water services management

WATER SECURITY

Hydraulic structures and hydraulic processes
Environmental impact of water-related projects
Management of floods and droughts
Flood resilience of urban areas
Integrated coastal modelling
Performance and reliability of flood defence systems and coastal structures
Integrated coastal zone management
Port design
Hydraulic structures and hydraulic systems
Environmental impacts of hydraulic works
Institutional aspects of system management
Integrated lowland development
Hydrology and Climate (hydrological processes and process-based modelling)
Physical and biogeochemical processes of groundwater systems



ONLINE AND SHORT COURSES

UNESCO-IHE is making efforts to make water education more accessible and affordable for increasing numbers of students. One way the Institute achieves this is increasing the flexibility of educational programmes, which includes providing increasing numbers of online and short courses.



ONLINE COURSES

UNESCO-IHE offers high-quality online courses in some of the topics of high interest in the water sector. The innovative delivery format makes learning exciting, flexible, interactive and efficient. It allows participants to learn from different locations at their convenience and to immediately apply the newly acquired knowledge to their working environment. The online courses are beneficial to professionals working in public and private institutions, NGOs, and academic institutions, and are ideal for professionals with jobs and families, who want to upgrade their skills from the comfort of their home or office.

The online course's total study load is 140 hours, over the period in which the online course is given. A four month course thus takes around 8 hours of work per week. The guidance by lecturing staff during these online courses is intensive, and there are many opportunities to get feedback from and interact with fellow participants.

The Moodle based UNESCO-IHE eCampus is used to disseminate training material and for communication. It contains lecture notes and technological learning tools such as presentations, videos featuring case studies from various countries, interviews with experts, quizzes and audio material as well as a discussion area where both fellow participants and lecturers can meet each other. All courses run completely via eCampus, but course materials can be sent on CD as well. In some cases lectures and question-and-answer activities will be held through videoconferencing sessions.

For extra information on these online courses, including dates, please see page 24.

For the latest and in-depth information on these courses, including content and tuition fees please see our website:

SHORT COURSES

UNESCO-IHE conducts a wide range of short, intensive and highly specialised courses which are aimed at upgrading and refreshing the knowledge and skills of mid-career and senior experts. They are meant for professionals - or groups of professionals - with a specific area of interest, and a limited amount of time.

Short courses are from 1 to 4 weeks in length. The focus and content vary from specialised and technical matters to challenges and approaches in management. Didactical methods used in these short courses include lectures, individual or group exercises in the classroom, behind the computer, or in the laboratory. Fieldwork, excursions and field visits to relevant institutions often are a part of a short course, allowing the participants to come into contact with practical examples of the theory offered. Though case studies, role-play and workshops, content is made more interactive, and experience that the participants already have is shared.

For extra information on these short courses, including dates and duration, please see page 25.



It is now possible to earn European Credit Transfer System (ECTS) points for both online and short courses. For the latest information on earning ECTS points, including regulations and costs, please refer to our website.



Discounts on the tuition fee of online and short courses apply to the following:

- 30%: UNESCO-IHE alumni
- 30%: UNESCO-IHE G-PoWER partners
- 10%: UN family staff members
- 10%: groups of 5 or more (provided that the courses start at the same time and a group application has been sent)

Candidates from Netherlands Fellowship Programmes (NFP) countries are always encouraged to apply for an NFP fellowship for online and short courses, when applicable. See www.nuffic.nl for the eligible countries list, the deadline for your country, and the procedure. Be informed that you need an admission letter from UNESCO-IHE before you can apply for an NFP fellowship.



TAILOR- MADE TRAINING

UNESCO-IHE tailor-made training is designed for clients whose staff require tuition on specific topics or seek to develop a common knowledge base to address challenges ahead. The focus of the courses can be technical, managerial, strategic or operational, depending on the client's priorities.





Tailored MSc and short course on River Basin Management

The Ministry of Water Resources in China requested that UNESCO-IHE provide tailor-made group training on advanced methods of river basin management. The group consisted of 20 mid-level professionals and 18 senior staff members from the Ministry and from seven river basin commissions. The mid-level professionals enrolled in various Master Programmes dealing with different aspects of River Basin Management. Throughout this programme, they regularly met up with each other to take part in courses, excursions, multi-disciplinary group work, and research projects designed specifically for them. Towards the end of the research period,



the senior staff members joined them in the Netherlands for a short course for decision-makers. The research findings - all addressing topics of direct relevance to their organisations - were presented and their applicability was discussed. This approach resulted in a 'common language' for the whole group, who now continue to share best practices and exchange experiences with their colleagues in China.



Multiple Trainings for K-Water

K-Water, the Korea Water Resources Corporation has a long standing tradition of professionally educating its staff at UNESCO-IHE. Delivered



tailor-made trainings include 'Dissolved Air Flotation and Water Purification,' 'Water Supply and Membrane Technology,' 'Design and Modelling of Water Transport and Distribution,' and 'Wastewater Treatment Process Design and Modelling'. Courses combine regular modules of UNESCO-IHE Master Programme on Municipal Water and Infrastructure with tailored components consisting of exposure to Dutch and EU practice in the field, laboratory sessions, design and modelling workshops and presentation of state-of-the-art tools for optimisation of the design and operation of systems.

Cleaner Production Technologies in Ecuador

In Ecuador, UNESCO-IHE conducted a series of workshops for staff of industries, to stimulate the incorporation of cleaner production technologies at their workplace. The setup of each of these tailor-made trainings was similar: after participants were introduced to the general concepts of cleaner production and analysis thereof, they were guided in the process of writing a 'research proposal'. They returned to their workplace to collect information and data relevant to their research question. Guided by the Institute's staff, they came up with concrete proposals for improving their company's environmental standing. Later on, best practices were exchanged and further improved. Some of the results could be applied immediately to the work floor.

(Waste)water Sector Training for Decision Makers from Iran

The water and wastewater sector in Iran is facing a multitude of problems. In rural areas there is practically no provision of wastewater services (0.5%), while in urban areas 20% has access to wastewater services. The government of Iran has acknowledged this and has embarked on an ambitious plan to improve the water and wastewater provision in




the coming years. Within the project 'training and capacity building for the water and wastewater sector in Iran,' UNESCO-IHE - together with its Iranian partner the Power and Water University of Technology - provided 3500 technical and financial specialists and general managers with a total of 60 different one-week tailor-made training courses on the water and wastewater services sector, covering themes of general and financial management, technical innovations, improved operation and maintenance, and rural sanitation. Also, during study tours to dozens of water and wastewater utilities in France, Germany, Luxemburg, Belgium and the Netherlands, close to 400 senior sector staff members were exposed to West European practices.

UNESCO-IHE tailor-made training is designed for clients whose staff require tuition on specific topics or seek to develop a common knowledge base to address challenges ahead. The focus of the courses can be technical, managerial, strategic or operational, depending on the client's priorities.

Tailor-made training caters directly to client needs. This means they can be organised for groups of various sizes, from one or multiple organisations, sectors or regions. They can be designed to upgrade knowledge and skills, introducing new technologies, or strengthen sector performance, to name but a few options. The trainings can vary in length and depth, ranging from a course lasting several days, to a tailored MSc programme in which regular components are mixed with case studies and modules requested by the client.

Tailor-made training can be delivered on-site or using UNESCO-IHE in Delft as a base, or a combination of the two. A mixture of training instruments are utilised in creating tailor-made trainings, including lectures, workshops, group work, presentations, role-plays, case studies and study tours to project sites throughout Europe or the region where the training takes place.

A few examples of tailor-made training are presented here. For more examples, please see the website (link below). If you request information on how UNESCO-IHE could be of service to your organisation, please contact UNESCO-IHE's project office. Their contact information is also available from the website.



**STUDY
INFORMATION &
PRACTICAL
INFORMATION**



MSc PROGRAMME IN ENVIRONMENTAL SCIENCE

Provides professionals with the skills necessary to contribute, directly or indirectly, to the conservation and prudent use of natural resources for the benefit of society.

SPECIALISATIONS

ENVIRONMENTAL PLANNING AND MANAGEMENT

ENVIRONMENTAL SCIENCE AND TECHNOLOGY

ENVIRONMENTAL TECHNOLOGY AND ENGINEERING

LIMNOLOGY AND WETLAND ECOSYSTEMS

WATER QUALITY MANAGEMENT

The unsustainable management of natural resources hampers human development and exacerbates inequalities in wealth and welfare. Pollution, the depletion of natural resources and the disintegration of ecological functions are matters of local, regional and global concern. Economic development and rising living standards in the developing world contribute to the urgency of these important issues. It is not surprising, therefore, that the management of our precious water resources, environmental conservation, sustainable development and the alleviation of poverty are high on the agenda of global concerns.

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

To find sustainable solutions and improve the quality of human life, we must first understand the processes that sustain natural systems, how these systems function and how they interact with one other and with human society. The Environmental Science programme equips professionals with the necessary capacities, by offering a systems approach, which investigates subsystems and their interactions at global, regional and local scale, without losing sight of the overall picture. The programme balances a thorough knowledge of the disciplines taught and the added value of bringing these disciplines together in one coherent programme.

Aim of the Programme

The aim of the Environmental Science programme is to provide professionals with the knowledge and skills necessary to contribute, directly or indirectly, to the conservation and prudent use of natural resources for the benefit of society. Successful students will develop the capacity to carry out independent scientific and technical research and assessments on environmental issues. They will also learn to analyse and assess environmental systems and problems; be able to propose sustainable solutions to environmental problems; and contribute to the development of policies and strategies for environmental planning.



SPECIALISATION IN ENVIRONMENTAL PLANNING AND MANAGEMENT

You will be given the skills and know-how for strategic development, policy-making and decision-making for water quality management in urban and rural environments.

Prospective Students

The programme is intended for mid-career professionals with an interest in environmental sciences and in maintaining environmental integrity in relation to human development.

Learning Objectives

After successfully completing this specialisation, graduates will be able to:

- Use scientific data and results as a basis for policymaking;
- Analyse the complex and dynamic interactions between humans and their environment;
- Understand the role of governmental policy (at municipal, provincial, national, regional and global levels) in order to achieve sustainable development;
- Apply professional techniques and procedures for environmental planning;
- Apply principles of environmental policymaking, environmental legislation and institutional arrangements;
- Contribute to the development of environmental policy plans at various levels (company, municipal, national and international).

Db

SPECIALISATION IN ENVIRONMENTAL SCIENCE AND TECHNOLOGY

You will be introduced to research and development leading to technologies that address environmental problems, and learn to interact with stakeholders, managers and policy makers for appropriate remedial actions.

Prospective Students

Environmental Science and Technology is intended for mid-career professionals with an interest in environmental sciences and in maintaining environmental integrity in relation to human development.

Learning Objectives

After successfully completing this specialisation, graduates will be able to:

- Design, organise and conduct scientific environmental research, and contribute to the development of innovative technologies for solving environmental problems;
- Analyse dynamic interactions in complex human environment systems;
- Formulate data requirements and data collection strategies and design, and apply conceptual and computational models for a better understanding of these systems;
- Provide scientific advice for policy development and decision making.

Db Jdd This specialisation can also be followed as a Joint Double Degree programme, jointly offered with the Asian Institute of Technology. See our website for specific information on the partners, programme structure and admission procedure of this option.

SPECIALISATION IN ENVIRONMENTAL TECHNOLOGY AND ENGINEERING

You will learn to apply and develop environmental technologies, with a strong focus on multidisciplinary and problem-based technology development.

Environmental Technology and Engineering offers a wide range of optional study fields in an international environment, and intensively promotes networking and exchange of knowledge and experience between different nationalities.

Prospective Students

Environmental Technology and Engineering is geared towards students that are interested in deepening their knowledge on the the application of environmental technologies.

Learning Objectives

Successful graduates will be qualified for a professional career in:

- The private sector (environmental technological applications in different domains);
- Research sector (applied research at universities or research institutions, or in-company research);
- The public sector (consulting in local, regional and (inter)national administrations, defining and implementing environmental policy for sustainable development).

Jem This specialisation is a Joint Erasmus Mundus programme. See our website for information on the partners, programme structure and admission procedure.

SPECIALISATION IN LIMNOLOGY AND WETLAND ECOSYSTEMS

You will learn about the structure and functioning of aquatic and wetland ecosystems for their management and wise use, and learn how to interact with stakeholders, managers and policy makers for the development of best practices.

Prospective Students

This specialisation is intended for mid-career professionals with a background in biological or environmental sciences, and with a special interest in one of the following topics: aquatic ecology, limnology, wetland ecosystems, or aquatic resources management.

Learning Objectives

After successfully completing this specialisation, graduates will be able to:

- Design, organise and conduct scientific environmental research, and contribute to the development of innovative technologies for solving environmental problems;
- Analyse dynamic interactions in complex human environment systems;
- Formulate data requirements and data collection strategies and design, and apply conceptual and computational models for a better understanding of these systems;
- Provide scientific advice for policy development and decision-making.

J This specialisation is a Joint programme, is provided jointly with the Austrian Academy of Sciences and Egerton University in Kenya. See our website for specific information on the partners, programme structure and admission procedure of this option.

SPECIALISATION IN WATER QUALITY MANAGEMENT

You will be introduced to WQM in the catchment, urban and rural environments, and provided with the technical knowledge and management skills for decision-making and environmental planning.

Prospective Students

This specialisation is intended for mid-career professionals in technical as well as management positions, with responsibilities or specific interests in water and environmental science and in maintaining environmental integrity in relation to human development.

Learning Objectives

After successfully completing this specialisation, graduates will be able to:

- Identify 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;
- Explain principles, concepts and instruments of the main national and international water and environmental laws, and common and desired institutional and management arrangements;
- Successfully interpret, design and optimise water quality monitoring and assessment schemes in the watershed, for example, by using statistical and modelling tools.
- Critically analyse and evaluate alternative water quality management programmes in the watershed under different socio-economic and legal contexts, in a flexible way and often under data-poor conditions;
- Conduct - either independently or in a multi-disciplinary team - appropriate research in the field of water quality management, 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.

Db

MSc PROGRAMME IN WATER MANAGEMENT

Imparts knowledge and skills needed 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.

SPECIALISATIONS

WATER CONFLICT MANAGEMENT

WATER RESOURCES MANAGEMENT

WATER SERVICES MANAGEMENT

WATER QUALITY MANAGEMENT

Many regions of the world are increasingly facing challenges when it comes to managing water, and the nature of these challenges differs from one location to the next. It may relate to having too little water while water demands are growing explosively (water scarcity), too much water (flooding), and water of poor quality rendering it unfit to sustain the ecosystem or challenges related to providing water for people, industry and agriculture.

Addressing these challenges requires that water managers apply an integrated and interdisciplinary approach, involving hydrological, biophysical, chemical, economic, institutional, legal, policymaking and planning aspects. The MSc Programme in Water Management provides such an integrated and interdisciplinary approach. The programme brings together the scientific study of water resources with practical planning and management skills. Students are encouraged to study water management from a multi-disciplinary perspective and to seek integrated solutions.

Aim of the Programme

The Water Management MSc Programme aims to develop knowledge, insight and skills required to design, implement and evaluate water management policies and strategies to achieve effective governance of water resources. Once they have successfully completed this programme, graduates will be able to:

- Describe the rationale for an integrated and interdisciplinary approach for managing the water system;
- Identify and critically assess the different functions of the water resources system and the – often competing – interests of the various water users;
- Design, apply and evaluate models for institutional arrangements with emphasis on institutional reforms, policy development and good governance;
- Conduct research, independently or in a multidisciplinary team.



SPECIALISATION IN WATER CONFLICT MANAGEMENT

You will study the management of water resources conflicts, focusing on negotiation, mediation and decision-making processes, in order to prevent, manage and resolve water conflicts.

Prospective Students

The programme is designed for water managers as well as for institutional, legal international relations experts interested in local, national and international water management.

Learning Objectives

After completing this specialisation, graduates will be able to:

- Name and explain principles, concepts and instruments of main national and international water and environmental legislation and common and desired institutional and management arrangements;
- Design and apply models for institutional development with emphasis on water policy development, functional decentralisation and good governance;
- Design and facilitate inclusive consultation, negotiation, mediation and decision-making processes between water users and their representatives, water managers, politicians and other decision makers;
- Identify and critically assess the different functions of the water resources system and the, often competing, interests of the various water using sectors.

J This specialisation is a Joint programme, offered in collaboration with the University of Dundee and the UNESCO programme Potential Conflict to Cooperation Potential. See our website for specific information on the partners, programme structure and admission procedure of this option.

SPECIALISATION IN WATER RESOURCES MANAGEMENT

You will study the ways in which water availability and use are matched, and seek to develop alternative land use and water allocation policies, including legal and institutional arrangements from the local watershed to the basin scale and beyond.

Prospective Students

This specialisation is designed for engineers and managers responsible for planning, developing and implementing water resources projects and programmes. Experience has shown that students need to have an understanding of quantitative methods, such as statistical analysis, in order to successfully complete this specialisation.

Learning Objectives

After completing this specialisation, graduates will:

- Have an understanding of the physical water system and be able to predict and describe the impacts that human activities can have on the water and environmental resources;
- Be able to name and explain principles, concepts and instruments of main national and international water and environmental legislation and common and desired institutional and management arrangements;
- Be able to model processes of water allocation and use at different scales, and interpret model outcomes in order to gain an understanding of problems, trends, causes and effects;
- Be able to describe socio-economic concepts that are relevant for water resources planning and management.

Db

SPECIALISATION IN WATER SERVICES MANAGEMENT

You will focus on the provision of water and sanitation services and the management of related infrastructure, and design new institutional and financial instruments and business models for different socio-economic contexts.

Prospective Students

The Water Services Management specialisation is designed for professionals active in the water services sector. Students from line ministries, water supply and waste water companies, municipal assemblies, but also from an NGO or CBO background are set to benefit from the well-balanced programme.

Learning Objectives

After completing this specialisation, graduates will be able to:

- Argue and defend a given position in current debates about contemporary water services management issues;
- Design and assess institutional and management arrangements for the provision of water services in a multi-disciplinary manner;
- Explain concepts and procedures that are relevant for the day-to-day operational and organisational management of water sector utilities;
- Explain financial instruments for the provision of water services;
- Assess and design reform and change management strategies that integrate a combination of technical, legal, administrative and financial measures.

Db

SPECIALISATION IN WATER QUALITY MANAGEMENT

You will study the water quality impacts of human activities on aquatic ecosystems, as well as possible remedial actions, considering different levels of environmental stress and in various socio-economic contexts.

Prospective Students

The Water Quality Management specialisation aims at engineers and scientists responsible for or involved in planning, developing and implementation of water quality policies, strategies and programmes. Affinity with chemistry and biology is required for this specialisation.

Learning Objectives

After completing this specialisation, graduates will be able to:

- Demonstrate knowledge and understanding of the physical, chemical and biological processes of the environment and identify the impacts of human activities on aquatic ecosystems;
- Name and explain principles, concepts and instruments of main national and international water and environmental legislation and common and desired institutional and management arrangements;
- Interpret, design and optimise water quality monitoring and assessment schemes in the watershed;
- Apply experimental, statistical and modelling tools for interpreting and designing water quality management programmes;
- Critically analyse and evaluate alternative water quality management programmes.

Db

MSc PROGRAMME IN MUNICIPAL WATER AND INFRASTRUCTURE

Educates professionals in the fields of water supply, sanitation and integrated urban engineering, particularly in urban areas.

SPECIALISATIONS

SANITARY ENGINEERING

URBAN WATER ENGINEERING AND MANAGEMENT

WATER SUPPLY ENGINEERING

Recent decades have witnessed an increasing rate of urbanisation, particularly in developing regions and in countries in transition. About 80% of the world's mega-cities can be found in these regions. During the next two decades the world's population is expected to double. The high concentration of people in urban areas will place enormous pressure on the local environment and on available resources. It will also generate ever-higher, sometimes conflicting demands on services such as water supply and sanitation. At the same time, under decentralisation policies, the responsibility for delivering such services will be increasingly delegated to lower levels of government that are often ill equipped for this challenge in terms of financial and human resources.

Aim of the Programme

The MSc Programme in Municipal Water and Infrastructure educates professionals in the fields of water supply, sanitation and water engineering and management, particularly in urban areas.

Once they have successfully completed this programme, graduates can place their profession in the wider social, economic and environmental contexts of urbanisation and municipal water and infrastructure services provision. They will also be able to contribute to the development of innovative approaches to the provision of sustainable and equitable municipal water, sanitation, environmental and infrastructure services in developing and transition countries.

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Institute of Programme

SPECIALISATION IN SANITARY ENGINEERING

You will learn to design solid waste and wastewater collection and treatment systems and develop rational approaches towards sustainable waste management via cleaner production, appropriate treatment and re-use.

Prospective Students

This specialisation is designed for professionals interested in achieving and maintaining the environment and public health. It is particularly relevant to BSc-level engineers who are involved in (or wish to become involved in) the provision of sanitation services. Typical students include civil, process and sanitary engineers, university faculty and researchers, and technical managers.

Learning Objectives

After successfully completing this specialisation, graduates will be able to:

- Understand and explain the role of sanitation in the urban water cycle and its relation to public health and environment;
- Develop rational approaches towards sustainable wastewater management via pollution prevention, appropriate treatment, and resource recovery and re-use at both centralised and decentralised levels;
- Understand the relevant physical, chemical and biological processes and their mutual relationships within various sanitation components;
- Define and critically analyse, assess and evaluate various urban drainage and sewerage schemes, and wastewater, sludge and solid waste treatment process technologies;
- Analyse, synthesise, integrate, interpret, and discuss scientific and practical information in the context of preparing research and engineering projects including preparation of master plans, feasibility studies and preliminary designs;
- Apply modern tools for technology selection and to model sanitation components;
- Identify, develop and conduct independent research including field work, and laboratory research;
- Contribute to the development of innovative approaches to the provision of adequate and sustainable sanitation services in developing countries and countries in transition.

Db Jdd This specialisation can also be followed as a Joint Double Degree programme. See our website for specific information on the partners, programme structure and admission procedure of this option.

SPECIALISATION IN URBAN WATER ENGINEERING AND MANAGEMENT

You will learn to deliver both water and wastewater services within the context of the urban water cycle, covering both technical and management aspects.

The world is increasingly urbanised with 50% of the world's population living in urban areas. By 2030 in Asia 54% will live in cities compared to 39% in 2005. This enormous growth of urban areas poses several challenges, such as delivery of essential water and sanitation services and the management of the urban water cycle. This is also recognised by the Millennium Development Goals and Targets established at the UN Millennium Summit in 2000. These challenges are further complicated due to climate change, and it is foreseen that coping with them requires a substantial increase of highly trained and qualified human resources.

Prospective Students

This specialisation is intended for professionals from urban water and wastewater authorities, urban development ministries/authorities, water and environment ministries, private companies, academia, NGOs and city and municipal authorities dealing with or interested in water and sanitation services and managing the urban water cycle.

Learning Objectives

Graduates of the Urban Water Engineering and Management specialisation will:

- Understand the urban water cycle and its water system components, their characteristics and functioning within greater urban infrastructure systems;
- Understand urban water management problems including ability to: identify water systems' demand; deal with climatic and hydrologic uncertainties and/or extremes; institutional limitations; and work within a data-constrained environment;
- Be able to make appropriate and critical use of methods, techniques and tools necessary to monitor, analyse and design urban water systems including water supply infrastructure, drinking water treatment and distribution, wastewater collection, treatment, transport and disposal systems and drainage systems;
- Understand water infrastructure/asset planning, financing and management, and utility management;
- Be familiar with the concept of integrated water resources management (IWRM) and its application to a variety of water management problems at the urban catchment scale.

This specialisation is a Joint Double Degree programme, jointly offered with the Asian Institute of Technology. See our website for specific information on the partners, programme structure and admission procedure of this option.

Jdd

SPECIALISATION IN WATER SUPPLY ENGINEERING

You will learn to deal with technical aspects of drinking water treatment and distribution in an integrated way, paying attention to the choice of technologies and tools, ranging from low-cost to advanced options.

Prospective Students

This specialisation is designed for engineers working in water supply companies, municipal assemblies, government ministries and consulting companies dealing with water supply. It is particularly geared to the needs of mid-career engineers who are dealing with:

- Assessment of groundwater, surface water and drinking water quality;
- Surface water collection and storage;
- Conventional water treatment plants for groundwater and surface water;
- Design and operation of advanced drinking water treatment, including membrane filtration systems for desalination and water re-use applications;
- Sludge treatment and disposal;
- Water transport and distribution;
- Master planning of water supply projects;
- Urban and municipal engineering.

Learning Objectives

After successfully completing this specialisation, graduates will be well equipped to understand:

- The structure of drinking water supply systems, including water transport, treatment and distribution;
- Water quality criteria and standards, and their relation to public health, environment and urban water cycle;
- Physical, chemical and biological phenomena, and their mutual relationships, occurring within water supply systems;
- Water quality concepts and their effect on treatment process selection;
- The interaction of water quality and the materials being used;
- Hydraulic concepts and their relationship to water transport in treatment plants, pipelines and distribution networks;
- The importance and methods of operation and maintenance of water supply systems;
- Options for centralised and urban systems versus decentralised and rural systems;
- Be able to define and evaluate project alternatives on basis of chosen selection criteria;
- Water supply engineering within a watershed context.

In addition, graduates will be able to:

- Design and rehabilitate raw water abstraction, transport, treatment and distribution processes and systems;
- Use statistical and modelling tools for simulation, prediction of performance and operation of water supply system components;
- Communicate effectively in oral and written presentations to technical and non-technical audiences.

Db Jdd This specialisation can also be followed as a Joint Double Degree programme. See our website for specific information on the partners, programme structure and admission procedure of this option.

MSc PROGRAMME IN WATER SCIENCE AND ENGINEERING

Focuses on the ability to develop infrastructure and gives knowledge on hydrological and hydraulic processes and modelling tools for improved water management in coastal zones, river basins and agricultural areas.

SPECIALISATIONS

AGRICULTURAL WATER MANAGEMENT FOR ENHANCED LAND AND WATER PRODUCTIVITY

ECOHYDROLOGY

FLOOD RISK MANAGEMENT

HYDRAULIC ENGINEERING AND RIVER BASIN DEVELOPMENT

HYDRAULIC ENGINEERING - COASTAL ENGINEERING AND PORT DEVELOPMENT

HYDRAULIC ENGINEERING - LAND AND WATER DEVELOPMENT

HYDROINFORMATICS - MODELLING AND INFORMATION SYSTEMS FOR WATER MANAGEMENT

HYDROLOGY AND WATER RESOURCES

INTEGRATED LOWLAND DEVELOPMENT AND MANAGEMENT PLANNING

The Water Science and Engineering MSc Programme focuses on the management and development of water resources and water flows and quality in the natural environment, while addressing the multi-disciplinary character of human activities dealing with water.

The specialisations within this programme explore natural and anthropological influences on the water cycle, from the perspectives of civil engineering, technology and earth sciences. They are of direct relevance to sustainable development because they prepare graduates to improve the management of human impact on water resources, design simulation models for various phases of the water cycle, and develop methods of reducing the impact of water-related natural hazards.

Aim of the Programme

The programme aims to deepen the knowledge, insight and skills for hydraulic engineering (part of civil engineering), hydroinformatics (a technology discipline) and hydrology (an earth system science). Graduates are able to work in professional water sector environments that require academic skills.

In particular, this programme provides the education to:

- Improve the management of water resources through assessing and monitoring their vulnerability to hazards;
- Sustain economic development by better flood and drought protection and hazard reduction, in an era of global climate change;
- Improve environmental and public health through pollution prevention and treatment.
- Sustain and improve water supply, power generation and agriculture through integrated water resources development;
- Improve food production by developing, operating, maintaining and optimising water-related infrastructure;
- Sustain economic growth through the development of coastal and riparian zones;
- Manage and control water systems in an integrated and sustainable way, with stakeholders, through the development of technologies to simulate such systems.

SPECIALISATION IN AGRICULTURAL WATER MANAGEMENT FOR ENHANCED LAND AND WATER PRODUCTIVITY

You will learn to deal with the scientific and engineering knowledge needed for the sustainable management of water for agriculture, learning about irrigation and drainage, IWRM, agronomy, hydrology and hydrodynamics.

The population growth - particularly high in emerging and developing countries - means that these countries have an additional challenge to meet the Millennium Development Goal of food security by increasing production in their own territory, where possible combined with increased import of food. Researches estimate that in the coming decades about 80-90% of the required increase will need to be realised on existing cultivated land, and about 10-20% on newly reclaimed land. For sustainable rural development, socio-economic and environmental aspects play crucial roles. It is also imperative that the modernisation of existing water management systems, including management transfers, remains a continued process.

Increased vulnerability of agriculture is due to flooding caused partly by the impacts of climate change, land subsidence and the escalating value of land because of the requirement of higher yields per hectare. This necessitates the agricultural water management in such areas to be integrated with flood management and flood protection provisions.

Prospective Students

The target group for this specialisation are professionals working at ministries, authorities, river basin and water users associations, universities, research institutes, civil society organisations, and consultants dealing with or interested in the fields of planning, water resources, agriculture, environment, public works, or related fields.

Learning Objectives

Upon successful completion of this Joint Double Degree programme, the graduates will:

- Have in-depth understanding and specific knowledge of the latest concepts and theories of irrigation, drainage, flood protection, land reclamation and consolidation technologies for sustainable development, and the cross-sectoral linkages comprehending wider aspects of society, economy and the environment;
- Use the latest hydraulic engineering and hydrological methods to apply in planning, design and implementation of irrigation, drainage and flood protection schemes, independently or in a multidisciplinary team;
- Be able to identify and cross-evaluate alternative land and water development options for areas under different land uses and assess their feasibility; technologically, economically, and environmentally;
- Be able to engage in or advise the developers, system managers and water users on the participatory development and management, including operation and maintenance of the irrigation, drainage and flood protection schemes;
- Have acquired knowledge and understanding of contemporary research issues in the field of land and water development.

Jdd This specialisation is a Joint Double Degree programme, jointly offered with the Asian Institute of Technology. See our website for specific information on the partners, programme structure and admission procedure of this option.

SPECIALISATION IN ECOHYDROLOGY

You will be provided with knowledge and understanding of the ecological processes that support the resilience of aquatic ecosystems, and how these processes can be harmonized with engineering infrastructures at the river basin and used to sustain aquatic ecosystems quality and revert degradation.

Throughout the world aquatic ecosystems have experienced environmental degradation. Present remedial measures based on engineering and technological fixes have been unable to restore the ecological processes and reinstate the full beneficial functions and services of degraded aquatic ecosystems.

This Erasmus Mundus programme on Ecohydrology aims to create highly specialised professionals, both with understanding about the ecological processes and ecosystems functioning, as well as the harmonisation of such ecological processes with more traditional engineering approaches.

Prospective Students

This Joint Erasmus Mundus programme is for students who aim to have a broad vision of the processes occurring in the river basin and in the coastal regions, and that use advanced tools such as numerical models, decision support systems and geo-processing and analysis tools. This programme is open to students with a BSc in biology, ecology, geosciences, environmental sciences, limnology, oceanography, marine sciences, aquatic engineering or similar subjects.

Learning Objectives

Graduates of this Joint Erasmus Mundus programme will be equipped with the scientific knowledge to understand the different spatial and temporal scales (from the catchment basin to molecular level and from paleo to present conditions) acting on aquatic ecosystems and their effects on freshwater and marine ecosystems dynamics and resilience. They will have learnt to:

- Develop a holistic perspective of aquatic ecosystems functioning to support the design and implementation of creative solutions, based on the use of natural ecosystem functions and processes in freshwater and coastal areas;
- Be able to develop the research and applications required to support and implement conservation and adaptation measures for the sustainable management of aquatic environments;
- Use advanced tools in the planning, conception and design phases of Ecohydrologic projects;
- Develop decision supporting systems for community policy;
- Become able to create an interface between researchers, stakeholders and decision makers.

Jem This specialisation is a Joint Erasmus Mundus programme. See our website for specific information on the partners, programme structure and admission procedure of this option.

SPECIALISATION IN FLOOD RISK MANAGEMENT

You will develop scientific and engineering knowledge needed to reduce the human and socio-economic losses caused by flooding while at the same time taking into account the social, economic, and ecological benefits from floods and the use of flood plains or coastal zones.

The new Joint Erasmus Mundus programme in Flood Risk Management integrates the complementary topics of global changes and monitoring natural processes, modelling their behavior and interaction, formulating the decisions based on interrogation of these integrated models and implementing these decisions in the context of socio-economic and institutional framework. The subjects covered include hydrology, meteorology, monitoring, hydroinformatics, modelling, various types of flooding (fluvial, urban and coastal), risk management, spatial planning and socio-economic and institutional framework.

Prospective Students

This Joint Erasmus Mundus programme is open to students with a BSc, preferably in civil or environmental engineering, but otherwise in geosciences, environmental sciences, limnology, oceanography, geography, geology or natural resources.

Learning Objectives

Successful students of the Joint Erasmus Mundus programme in Flood Risk Management will have:

- A broad and cross-boundary scientific knowledge on flood risk management;
- A comprehensive knowledge base and understanding of the current theory and practice relating to flooding and flood management;
- The fundamental knowledge leading to the understanding of socio-economic issue related to flooding;
- A broad scientific knowledge about conservation, restoration and management measures to overcome challenges imposed on water by humans and by climate change;
- An extended knowledge on a basin-wide approach to flood risk management.

Jem This specialisation is a Joint Erasmus Mundus programme. See our website for specific information on the partners, programme structure and admission procedure of this option.

SPECIALISATION IN HYDRAULIC ENGINEERING AND RIVER BASIN DEVELOPMENT

You will develop scientific and engineering knowledge needed to design and implement projects for sustainable use of river systems and their resources, learning about the design of hydraulic structures, modeling of the river, and flood management.

The need for food, energy, flood risk management and domestic and industrial water supply requires that water will be used and managed more efficiently than in the past. Traditional river engineering has had serious consequences for riverine ecosystems and land use, causing damage to flora and fauna and sometimes exacerbating floods and droughts.

The Hydraulic Engineering and River Basin Development specialisation educates engineers involved in design and implementation of projects for sustainable use of river systems and their resources (fresh water, floodplain space and even sediments). Emphasis is laid on different scales of water projects (catchments, river stretches and floodplains).

Prospective Students

Students may want to follow this specialisation if they wish a career in government services, consultancy, or education and research institutes. Students typically have a BSc degree in civil engineering with a hydraulic engineering background, and have worked for at least three years after graduation in professional practice or in a university or research environment in the field of river engineering and river basin development. Knowledge in mathematics, statistics and physics is a prerequisite. Computer literacy is a valuable asset.

Learning Objectives

After successfully completing the specialisation, graduates will be equipped to:

- Understand physical processes and natural phenomena in river basin systems, the effect of human interference in river basins, such as river structures and training works, and the management of floods and droughts;
- Master the major hydraulic methodologies and applications for the design of (large) river structures and river modelling techniques with regard to data collection, processing and analysis;
- Evaluate and analyse river basin systems and processes at a wide range of scales for the purpose of water resources, including morphological assessments, impact analysis of hydraulic structures and natural hazards assessment and mitigation taking into account relevant aspects of environmental, economical and social planning and management;
- Design and conduct hydraulic research, experiments and tests for both practical and scientific purposes;
- Have the skills to apply and integrate relevant concepts and methodologies in the area of hydraulic, hydrological and geotechnical engineering and research as well as applying computational principles within the context of hydraulic engineering.

SPECIALISATION IN HYDRAULIC ENGINEERING - COASTAL ENGINEERING AND PORT DEVELOPMENT

You will be taught the technical background and practical skills to plan, model, design and manage coastal engineering and port development projects, and learn to analyse coastal problems and conceive appropriate solutions.

The management of resources in coastal areas and related hydraulic engineering works has increased in importance and complexity and often requires innovative solutions. Large coastal engineering projects undertaken in The Netherlands include major land reclamation works, the Delta Works (1958-1986) including storm surge barriers, and the Europort / Maasvlakte extension of the Port of Rotterdam.

Prospective Students

Students typically have a BSc degree in civil engineering or a related field and a hydraulic background. He or she has worked for at least three years in professional practice or at a university or research establishment, and is eager to acquire practical skills and knowledge to solve engineering and coastal zone / port management problems. A future career may be in government services, consultancy, or education and research institutes.

Learning Objectives

Upon successful completion of this specialisation, graduates will be able to:

- Define and analyse coastal problems and conceive alternative solutions;
- Apply latest developments in planning, design and management to coastal engineering and port development;
- Understand and quantify the interactions between a coastal or port project and the environment;
- Organise and co-operate in a multi-disciplinary group to plan and implement an integrated coastal zone management plan; or
- Understand developments in maritime transport, the role of a port in the logistic chain, and aspects of containerisation and port management.

Db J This specialisation can also be followed as a Joint programme. See our website for specific information on the partners, programme structure and admission procedure of this option.

SPECIALISATION IN HYDRAULIC ENGINEERING - LAND AND WATER DEVELOPMENT

You will learn to plan, design, operate and maintain land and water resources and water-related infrastructure, emphasising on the modernisation of irrigation, drainage and flood protection schemes, and land use for agriculture.

Prospective Students

The land and water development engineer is concerned with the development, adaptation and management of land and water resources for the different types of land use, with a focus on agricultural purposes. The typical student has a BSc degree in agricultural or civil engineering with a hydraulic background, and has worked in professional practice or in a university or research environment in irrigation, drainage or land and water development for at least three years. The participant is eager to acquire practical skills and knowledge to solve engineering, and water management or flood protection problems. Computer literacy is a valuable asset. Future careers may be in government services, consultancy, or education and research institutes.

Learning Objectives

Graduates who have successfully undertaken this specialisation will be equipped to:

- Define the level of service that client groups may expect from irrigation, drainage or flood protection systems and translate them into physical infrastructure, management activities, and organisational arrangements;
- Advise developers, system managers and water users on the operation and maintenance of irrigation, drainage and flood protection systems;
- Understand the economic, social and environmental aspects of land and water development concepts;
- Make a development plan for an irrigation and drainage system, covering design, water management, and operation and maintenance;
- Monitor and evaluate the technical, managerial and institutional performance of irrigation and drainage systems;
- Use state-of-the-art knowledge to evaluate the application of modern irrigation and drainage methods;
- Provide alternative technologies to develop land use, with a focus on rural areas;
- Assess the technical, socioeconomic and environmental feasibility of land and water development and management plans to support sustainable development;
- Provide for different levels of service and associated cost and benefits for a range of short, medium and long-term land and water development and management planning horizons;
- Use objective criteria for decision making on maintenance, replacement or modernisation.

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SPECIALISATION IN HYDROINFORMATICS - MODELLING AND INFORMATION SYSTEMS FOR WATER MANAGEMENT

You will be able to solve problems of hydraulics, hydrology and environmental engineering for better water management using simulation modelling and IT. You will also get acquainted with models applied to water-based systems, learn to design and integrate decision support systems, and develop skills to provide expert advice to managers and users of advanced tools.

Hydroinformatics is the study of the flow of information related to the flow of water (and all that it transports) and the interactions with its natural and artificial environments. It involves mathematical modelling and advanced information technology tools, and their application to hydraulic, hydrological and environmental problems of urban, inland and coastal waters. It provides the computer-based, decision-support systems that are revolutionising traditional planning, design and decision-making methodologies. A hydroinformatics system also allows an expert user to factor-in the physical, social and environmental consequences resulting from any action on a water body, as well as constraints expressed in natural language and to merge these with measured data, making results available to hydro-scientists and engineers in the form of computer-based, environmental impact assessment and decision-support systems.

Prospective Students

Hydroinformatics engineers participate in defining, building and supplying the tools that enable decision-makers to manage aquatic resources and the environment. They work with engineers, scientists and people from other interest groups. This specialisation is designed for hydraulic, environmental and water resources engineers from universities, consulting firms, research institutes, water boards and other government agencies. The typical participant uses or advises others in the use of mathematical models and hydroinformatics systems for planning, designing or managing the aquatic environment.

Learning Objectives

By the end of the course graduates will:

- Have a good understanding of the fundamentals of a range of physical processes, advanced modelling techniques and information technology for water management;
- Be able to select and use simulation models applied to water-based systems in a wide variety of hydraulic, hydrologic and environmental engineering situations;
- Be able to use current software tools, and know their advantages and limitations;
- Know how to design, develop and integrate decision-support systems and tools;
- Be able to provide advice to managers and users of advanced tools;
- Understand and practice collaborative work, making use of Internet-based platforms.

Db J Jdd This specialisation can also be followed as a Joint programme or Joint Double Degree programme. See our website for specific information on the partners, programme structure and admission procedure of this option.

SPECIALISATION IN HYDROLOGY AND WATER RESOURCES

You will deal with surface and groundwater, addressing both water quantity and quality, learning to understand human influences on the hydrological system, and receive tools, such as modelling, for the proper integration of hydrological knowledge and analysis in water resources planning and management.

Hydrology is an earth science studying the circulation and distribution of global water and encompassing elements of other disciplines, such as geology and geophysics, meteorology and climatology, ecology and engineering.

Hydrologists play a key role in integrated water resources assessment and management. The programme enables graduates to understand, describe and quantify the physical and bio-geochemical processes of the hydrological cycle so that they can better plan, manage and engineer natural water resources.

Prospective Students

The target group for this specialisation are people aiming to work in river basin management, prediction and mitigation of floods and droughts, water supply, water quality and public health, hydropower, land use and development, environmental survey and planning, and other related fields.

Learning Objectives

Graduates who have undertaken the Hydrology and Water Resources specialisation will be equipped with:

- An in-depth understanding of theories and concepts in surface and subsurface hydrology, the physical, chemical and biological interactions between the hydrosphere, the lithosphere, the biosphere and the atmosphere.
- A thorough awareness of natural and human-induced variations of hydrological systems.
- Good knowledge of the literature and contemporary research questions in hydrology.

Graduates will be able to:

- Apply and integrate relevant physical, chemical, applied mathematical, computational and earth-scientific principles and concepts.
- Use information and communication technology within a hydrological context.
- Master the major hydrological methodologies and applications with regard to water quantity and quality, including techniques for data collection, processing and analysis, and the application of catchment hydrological modelling and aquifer modelling techniques.
- Evaluate and analyse hydrological systems and processes at a wide range of scales in both space and time for the purpose of water resources assessment, natural hazard assessment and mitigation, and environmental planning and management.
- Design and conduct hydrological research and experiments for applied or scientific purposes, independently or within a team.

In addition, graduates will:

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

Db J This specialisation can also be followed as a Joint programme. See our website for specific information on the partners, programme structure and admission procedure of this option.

SPECIALISATION IN INTEGRATED LOWLAND DEVELOPMENT AND MANAGEMENT PLANNING

You will learn how to deal with integrated lowland development and management, including the required policies and approaches, the resulting plans and planning, and the actual design, implementation, operation, maintenance and management of the required programmes and projects.

Lowlands can be found all over the world, along the coasts, in river floodplains and as inland depressions. Generally they are sensitive areas with a high ecological value by nature. Most of the lowlands in Indonesia are still in their natural state. Parts have been reclaimed, primarily for agricultural land use. Urbanisation and industrialisation take place, especially in the lowlands in densely populated areas.

Because of population growth, the increase in standard of living, the need for food, and the on-going urbanisation, the Indonesian government is putting a lot of effort in the future development of the lowlands based on an integrated approach. There is a shortage of skilled staff, so the Indonesian government, through its National Development Planning Agency BAPPENAS, requested the Sriwijaya University in Palembang, South Sumatra, to develop this programme jointly with UNESCO-IHE.

Prospective Students

The specialisation in Integrated Lowland and Development and Management Planning aims at civil, agricultural and environmental engineers or equivalent, who are already specialised in water management (irrigation, drainage) or in integrated lowland development or management.

Learning Objectives

Successful students will be able to:

- Develop the required policies and approaches for integrated lowland development and management;
- Design the necessary plans and make a planning for their implementation;
- Operate, maintain and manage the required programmes and projects for sustainable integrated lowland development.

J This specialisation is a Joint programme. See our website for specific information on the partners, programme structure and admission procedure of this option.

Service Oriented Management of Irrigation Systems	15 January - 15 May
Flood Modelling for Management	1 March - 15 May
Ecological Sanitation	1 March - 30 June
Integrated Coastal Zone Management	1 March - 30 June
Integrated River Basin Management	1 March - 30 June
Sanitation-related Urban Groundwater Pollution	1 March - 30 June
Water Quality Assessment	1 March - 30 June
Wetland Management	1 March - 30 June
Policy and Management in Developing Countries	1 March - 30 June
Biological Wastewater Treatment: Principles, Modeling and Design	1 March - 30 June
Water and Environmental Law and Policy	1 April - 15 July
Cleaner Production and the Water Cycle	1 September - 31 December
Public Private Partnerships	1 September - 31 December
Solid Waste Management	1 September - 31 December
IWRM as a Tool for Adaptation to Climate Change	1 September - 31 December
Water Transport and Distribution	1 September - 31 December
Constructed wetlands for wastewater treatment	1 September - 31 December
Participatory Approaches to Sanitation *	1 September - 31 December
Sanitation, Hygiene and Public Health *	1 September - 31 December
Greywater Management, Treatment and Use *	1 September - 31 December
Finances and Economic Instruments in Sanitation *	1 September - 31 December
Decision Support Systems in River Basin Management	15 September - 30 November
Modelling Sanitation Systems	1 November - 29 February 2012

* These online courses are NOT eligible for NFP fellowships.

SHORT COURSES 2011

Coastal Systems	10 - 28 January
Coastal and Port Structures I	7 - 25 February
Conventional Surface Water Treatment	7 - 25 February
Water Quality Assessment	7 - 25 February
Negotiation and Mediation for Water Conflict Management I	7 - 25 February
Lake Ecology **	14 February - 4 March
Coastal and Port Structures II	28 February - 18 March
Constructed Wetlands for Wastewater Treatment	28 February - 18 March
Environmental Engineering	28 February - 18 March
Environmental Policy Making	28 February - 18 March
Groundwater Resources and Treatment	28 February - 18 March
Negotiation and Mediation for Water Conflict Management II	28 February - 18 March
Stream and River Ecology **	7 - 25 March
Nanotechnology for Water Technology	28 March - 8 April
Advanced Water Treatment Technology	28 March - 15 April
Environmental Monitoring and Modelling	28 March - 15 April
Environmental Planning and Implementation	28 March - 15 April
Financial Management of Water Organisations	28 March - 15 April
Groundwater Exploration and Monitoring	28 March - 15 April
Hydrological Data Collection and Processing	28 March - 15 April
Integrated Asset Management Systems	28 March - 15 April
River Basin Modelling	28 March - 15 April
Service Oriented Management of Irrigation Systems	28 March - 15 April
Resource Oriented Sanitation	28 March - 15 April
Water Resources Planning	28 March - 15 April
East-African Wetlands for Water Quality **	4 - 22 April
Fisheries and Aquaculture **	25 April - 13 May
Integrated Coastal Zone Management	26 April - 6 May
International Port Seminar	26 April - 13 May
Cleaner Production and the Water Cycle	26 April - 13 May
Tracer Hydrology and Flow System Analysis	26 April - 13 May
Urban Flood Modelling and Disaster Management	26 April - 13 May
Water and Environmental Law and Institutions	26 April - 13 May
Water Transport and Distribution I	26 April - 13 May
Modelling Wastewater Treatment Processes and Plants	26 April - 13 May
Introduction to River Flood Modelling	26 April - 13 May
Environment and Global Change: Uncertainty & Risk Assessment	2 - 13 May
Applied Groundwater Modelling	14 June - 1 July
Aquatic Ecosystems: Processes and Applications	14 June - 1 July
Environmental Systems Modelling	14 June - 1 July
Flood Risk Management	14 June - 1 July
Industrial Effluents Treatment and Residuals Management	14 June - 1 July
Managing Water Organisations	14 June - 1 July
Urban Water Systems Modelling	14 June - 1 July
Water Treatment Processes and Plants	14 June - 1 July
Decentralised Water Supply and Sanitation	4 - 22 July
Public-Private Partnerships in the Water Sector	4 - 22 July
Solid Waste Management	4 - 22 July
Watershed and River Basin Management	4 - 22 July
Water Transport and Distribution II	4 - 22 July
Climate Change in Integrated Water Management	4 - 22 July
Modelling Urban Drainage and Sewerage	4 - 22 July
Remediation and Handling of Contaminated Sediments *	29 August - 2 September
Spate Irrigation and Water Management under Drought and Water Scarcity	5 - 16 September
Morphological modeling using Delft3D *	12 - 16 September
World History of Water Management *	12 - 16 September
Soil and Water Assessment Tool *	19 - 23 September
Membranes in Drinking & Industrial Water Treatment *	3 - 7 October
GIS and Remote Sensing	31 October - 11 November
GIS Modelling SWAT	31 October - 11 November

* These short courses are NOT eligible for NFP fellowships.

** These short courses are held at Egerton University in Kenya.

UNESCO-IHE is the largest international post-graduate water education facility in the world. The institute confers fully accredited MSc degrees and promotes PhDs. Since 1957 the Institute has provided post-graduate education to more than 14,500 water professionals from 162 countries, the vast majority from the developing world. Over 100 PhD fellows are currently enrolled in water-related research. The Institute carries out numerous research and capacity development projects throughout the world.

UNESCO-IHE envisions a world in which people manage their water and environmental resources in a sustainable manner, and in which all sectors of society particularly the poor, can enjoy the benefits of basic services. The mission of UNESCO-IHE 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.

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UNESCO-IHE is at the centre of a vast international network of water-related institutions, and functions as an interface between knowledge networks and centres, public and private sector organisations, scientific and professional associations and other members of the international water community. Through these partnerships, the Institute broadens its knowledge base and increases its effectiveness in developing the capacities of water sector organisations and individuals worldwide.

UNESCO-IHE centres its education, research and capacity building programmes around Water Security, Environmental Integrity, Urbanisation, Water Management and Governance, Information and Communication Systems. Through each of these themes, the Institute addresses the major issues and challenges faced by many countries around the world.



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