



MSc Programmes
Online & Short Courses
PhD Programme

Education and Training Guide 2016



UNESCO-IHE
Institute for Water Education

Where the water world meets

A photograph of two men in a lecture hall. The man in the foreground is a Black man wearing a red and white checkered shirt, looking intently at a laptop screen. The man in the background is a man of East Asian descent wearing a grey vest over a white patterned shirt, leaning forward and pointing at the laptop screen. The setting is a lecture hall with rows of grey chairs.

Graduate education at UNESCO-IHE is science-based and highly relevant particularly in a development context.



WELCOME TO UNESCO-IHE

UNESCO-IHE envisages 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. Graduate education at UNESCO-IHE best prepares future water professionals and water leaders to contribute to building this world.

Challenges related to globalization, environmental and societal change will expose future graduates to water problems of unprecedented complexity and magnitude. They therefore require a range of knowledge, skills and attitudes to be optimally prepared and to contribute effectively to the development of integrated solutions. This implies that due attention is paid not only to the academic fields of engineering, natural sciences and social sciences, but also to the development of trans-disciplinary skills that facilitate the work at the interfaces of traditional disciplines and make the connection to a range of stakeholders from the real world.

UNESCO-IHE trained professionals gain access to a global partnership network, consisting of alumni, experts and renowned centres of knowledge, together providing a vast source of expertise to draw upon. Since its establishment in 1957, the Institute has educated over 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.

We look forward to welcoming you as a member of UNESCO-IHE's growing network of professionals.

Professor Stefan Uhlenbrock, Officer in Charge and Vice Rector Academic and Student Affairs

Why UNESCO-IHE?

- over 55 years of experience in graduate water education
- close ties to the UN system
- learner-centered, active learning
- personal guidance and mentoring
- internationally renowned professors and lecturers
- a truly international educational environment
- living and studying in a vibrant city in the heart of Europe

Delft, Netherlands, Europe

UNESCO-IHE is located in the historical city centre of Delft, a city of great charm characterized by ancient canals, beautifully kept monuments and historic squares. It is also an ideal starting point to explore the Netherlands and Europe.



THE INSTITUTE'S FACILITIES AND SERVICES

- 14,000 m² premises, including three interconnected buildings;
- Four modern teaching and research laboratories - aquatic ecology, microbiology, process technology and analytical laboratories - including state of the art instrumentation;
- A library with online connections to national and international resource centres, and a reading room containing many international journals and magazines;
- Modernised classrooms and multifunctional lecture theatres;
- A fully equipped auditorium seating 300 and a videoconferencing studio;
- Notebooks for all participants and extensive computing facilities;
- Flexible and group work-spaces, 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 and meditation room.

DELFT

Delft is known for its historic town centre with canals, Delft Blue pottery, painter Johannes Vermeer and scientist Antony van Leeuwenhoek and its association with the royal House of Orange-Nassau.

Since Delft is a university city, there are plenty of cultural events to be enjoyed throughout the year, as well as museums and theatres. 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 both the Netherlands' and Delft's history and continues to do so today. Therefore, it is no surprise that many science and technology organizations related to water have chosen Delft as their home base. UNESCO-IHE maintains close working relationships to various Delft-based research and education institutes, such as the Delft University of Technology, Deltares and the Delfland Water Board.

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 start location to explore other places of interest, both within the Netherlands and Europe.



HOUSING

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.

YOUR INTERNATIONAL EXPERIENCE

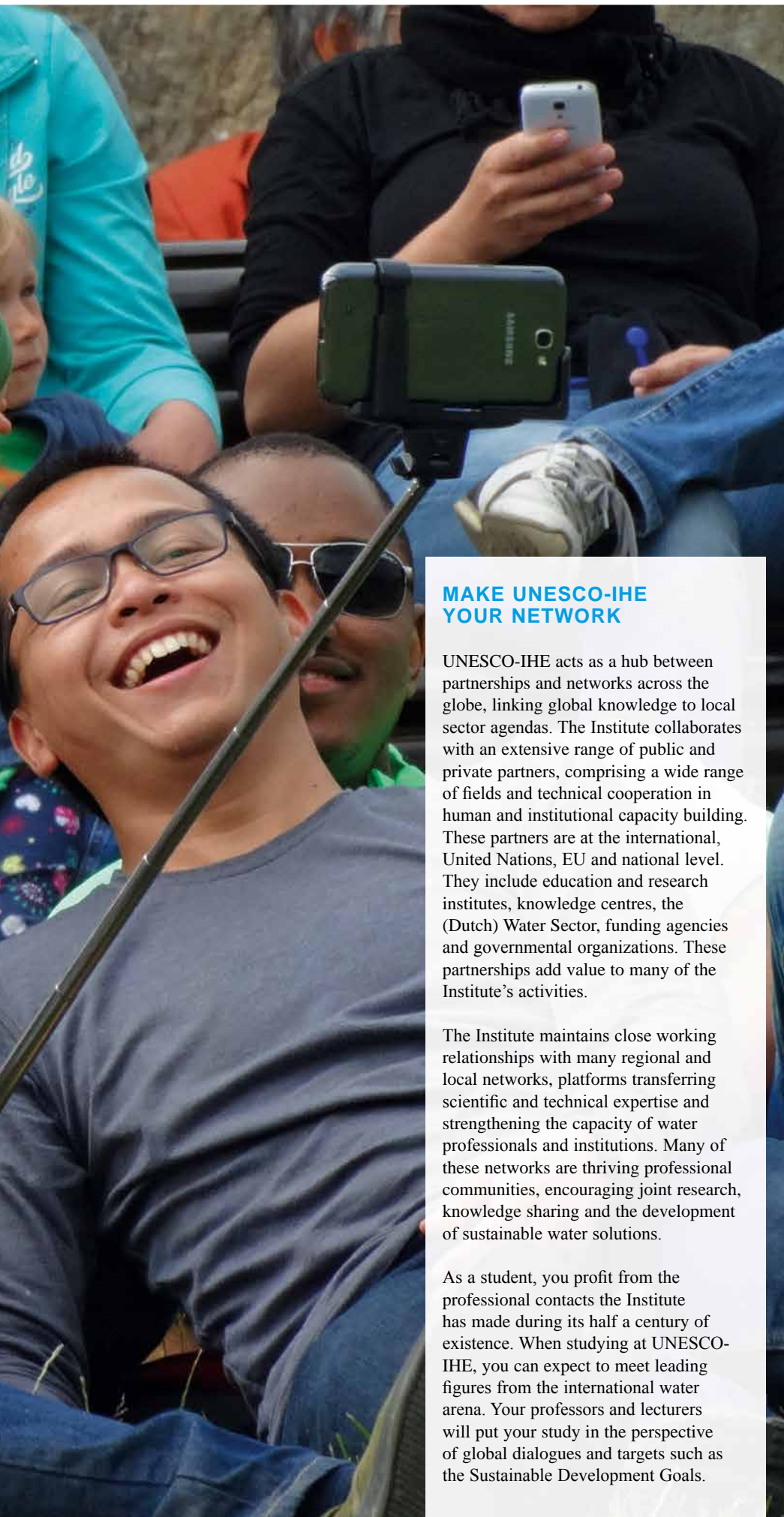
Staff at the Institute simplify your transition to the Netherlands by organizing the annual 'Introduction Days.' In these two weeks, they help you deal with various formalities such as residence permits, health insurance and bank accounts. Other activities during this period are an excellent way for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

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

A Network for Life



Studying at UNESCO-IHE is a life-changing experience. Students will be exposed to an intercultural environment characterized by plurality and diversity of ideas, experiences and disciplines resulting in intellectual, professional and personal growth.



ALUMNI NETWORK

Today, several ministers and government officials, heads of water-related institutions, and top scientists around the globe are UNESCO-IHE graduates.

As an alumnus, you remain part of the largest global partnership network of water professionals in the world. 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-zines. You are invited to join an Alumni Association in your country, independent associations where you can meet fellow alumni and enjoy social and professional activities.

MAKE UNESCO-IHE YOUR NETWORK

UNESCO-IHE acts as a hub between partnerships and networks across the globe, linking global knowledge to local sector agendas. The Institute collaborates with an extensive range of public and private partners, comprising a wide range of fields and technical cooperation in human and institutional capacity building. These partners are at the international, United Nations, EU and national level. They include education and research institutes, knowledge centres, the (Dutch) Water Sector, funding agencies and governmental organizations. These partnerships add value to many of the Institute's activities.

The Institute maintains close working relationships with many regional and local networks, platforms transferring scientific and technical expertise and strengthening the capacity of water professionals and institutions. Many of these networks are thriving professional communities, encouraging joint research, knowledge sharing and the development of sustainable water solutions.

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 Sustainable Development Goals.



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 Institute's 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 Programmes



UNESCO-IHE offers four accredited International Master of Science programmes, with a total of 17 specializations. Graduate education of UNESCO-IHE is science-based and aims to be highly relevant particularly in a development context.

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MSc PROGRAMMES

In the programmes, a mix of modern knowledge transfer methods is used, including lectures, workshops, role-plays, games, 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 specializations **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-month period. The research deals with a practical or theoretical problem and may be carried out in collaboration with an organization 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.

The so-called joint programmes **J** are MSc specialisations developed with and offered in collaboration with partner institutes. These joint programmes have varying start and end dates, and part of the programme is given at a partner institute, often in another country/continent.

MSc PROGRAMME IN ENVIRONMENTAL SCIENCE

Environmental Planning and Management		Db
Environmental Science and Technology	J	Db
Environmental Technology and Engineering	J	
Environmental Technology for Sustainable Development	J	
Limnology and Wetland Management	J	
Water Quality Management		Db

MSc PROGRAMME IN URBAN WATER AND SANITATION

Sanitary Engineering	J	Db
Urban Water Engineering and Management	J	
Water Supply Engineering	J	Db



MSc PROGRAMME IN WATER MANAGEMENT


Water Cooperation and Peace	J	
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THEMATIC PROFILES

Water Conflict Management		Db
Water Quality Management		
Water Resources Management		
Water Services Management		

MSc PROGRAMME IN WATER SCIENCE AND ENGINEERING

Groundwater and Global Change - Impacts and Adaptation	J	
Flood Risk Management	J	
Hydraulic Engineering and River Basin Development	J	Db
Hydraulic Engineering - Coastal Engineering and Port Development	J	Db
Hydroinformatics - Modelling and Information Systems for Water Management	J	Db
Hydrology and Water Resources	J	Db
Land and Water Development for Food Security	J	Db

 Joint programmes offered under the European Erasmus Mundus framework.

For extra information on these programmes please see pages 14-22.

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 curricula of the MSc Programmes consist of 106 ECTS credit points and have a Taught Part (61 ECTS credit points) and a Thesis Research Part (45 ECTS credit points). Research skills are also built up during the taught part.



PhD Programme

A man with dark hair, wearing a black and white plaid button-down shirt, is sitting at a desk in a library. He is holding an open blue book and looking directly at the camera with a slight smile. Behind him is a tall bookshelf filled with books of various colors. The background wall has a dark, patterned wallpaper.

The PhD Programme leads to a deepening of a field of specialization. PhD fellows do scientific research, often with conclusions that directly influence their region. At UNESCO-IHE, more than 135 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 INTERNATIONAL GRADUATE SCHOOL IN WATER AND DEVELOPMENT

Sustainable water use is frequently characterised by complex, so-called wicked, problems where traditional assumptions of knowability, causality and predictability may not apply. The fundamental importance of better connection between science, policy and society provides new demands on PhD graduates, who are increasingly expected to possess not only a deep knowledge of their own discipline, but are additionally capable of placing that knowledge in a wider understanding of societal needs.

UNESCO-IHE is well placed to play a significant role in supporting PhD level education that is targeted to water related problems not only in the global south and countries in transition, but in an increasingly globalised world.

In order to further develop a vibrant and an intellectually exciting research and development environment at the heart of the institute, which supports the PhD fellows and the institute to contribute to the global challenges for sustainable water use, the establishment in 2015 of the Graduate School in Water and Development is a fundamental next step. It is integral part of UNESCO-IHE's "increasing impact" strategy for 2020.

PhD PROGRAMME

Conducting research at UNESCO-IHE is a unique experience. You work together with other researchers – including around 20 post-docs, 135 PhD fellows, and 200 MSc students from different countries – all dealing with topics related to water and the environment.

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 research 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 Sustainable 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.

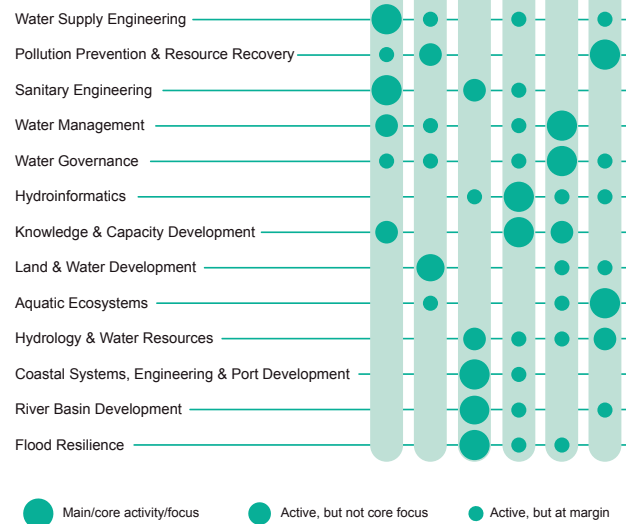
PhD research is often carried out in the 'sandwich' model. Preparation and final reporting – the first and last portion of the programme – are carried out in Delft, while actual research is done in the fellow's home country, under co-supervision of a local institute.

Regular contacts with the promotor are maintained through annual 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.

Research is conducted by the following academic departments and chair groups:

13 Chair Groups

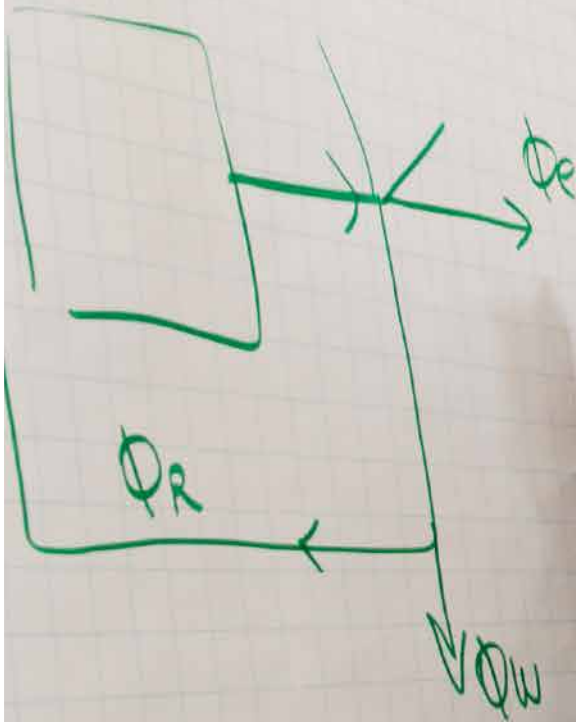


UNESCO-IHE is a member of the Research School for Socio-Economic and Natural Sciences of the Environment (SENSE). This Dutch research school focuses on both the natural sciences and socio-economic fields of environmental research. SENSE is accredited by the Royal Netherlands Academy of Sciences (KNAW),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



Online and Short Courses

class balance



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.



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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 23.

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SHORT COURSES

UNESCO-IHE conducts a wide range of short, intensive and highly specialized 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 3 weeks in length. The focus and content vary from specialized 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 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, please see page 24-25.



ECTS

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

The following discounts on the tuition fee of online and short courses are offered:

- 30%: UNESCO-IHE alumni
- 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)

Tailor-made Training



Tailor-made trainings are designed for clients whose staff require training 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

Tailor-made training caters directly to client needs. This means they can be organized for groups of various sizes, from one or multiple organizations, 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.

For more information on how UNESCO-IHE could be of service to your organization, contact UNESCO-IHE's liaison office. Their contact information is available from the website.

Graduate Professional Diploma Programme

The Graduate Professional Diploma Programme (GPD) disseminates knowledge and know-how to professionals who do not have the means or time to pursue a full-time Master, or who already have an MSc Degree and wish to specialize professionally.

GRADUATE PROFESSIONAL DIPLOMA PROGRAMME

In the programme you follow a sequence of four to five online courses, regular short courses or a combination of both. The ECTS points vary from 3 to 6 per course. The minimum study load for obtaining a diploma is 20 ECTS credit points, which equals a workload of 560 hours. The online courses can be followed part-time, without interrupting a day-time career.

To ensure that the programme fits the personal circumstances of the applicant, courses will be selected and a personal study plan will be designed in collaboration with a study advisor. The total duration of the programme depends on this study plan and varies between 1.5 to a maximum of 4.5 years.

Participants select among clusters of courses leading to different tracks; Sanitation and Sanitary Engineering and four newly developed tracks.

For extra information on these tracks and courses, please see page 23.



MSc PROGRAMME IN ENVIRONMENTAL SCIENCE

SPECIALIZATIONS

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.

SPECIALIZATIONS

Environmental Planning and Management

Environmental Science and Technology

Environmental Technology and Engineering

Environmental Technology for Sustainable Development

Limnology and Wetland Management

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.

SPECIALIZATION 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 specialization, 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, municipality, national and international).

Db

SPECIALIZATION 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 the development and application of technologies that contribute to maintain environmental integrity in relation to human development.

Learning Objectives

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

- Design, organize and conduct scientific environmental research, and contribute to the development of innovative technologies for solving environmental problems;
- Analyse dynamic interactions in complex human-technological-environmental 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 J This specialization is also offered as a joint programme, with Universidad Del Valle, Colombia. See our website for specific information on the partner, programme structure and admission procedure of this option.

Study Information

Delft-based MSc specialization

Joint programme

Joint Erasmus Mundus programme



SPECIALIZATION 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.

Prospective Students

Environmental Technology and Engineering is geared towards students that are interested in deepening their knowledge on 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).



This specialization is a joint programme offered under the European Erasmus Mundus framework with Ghent University, Belgium, and University of Chemistry and Technology, Czech Republic. See our website for information on the partners, programme structure and admission procedure.

SPECIALIZATION IN ENVIRONMENTAL TECHNOLOGY FOR SUSTAINABLE DEVELOPMENT

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

This specialisation is intended for mid-career professionals in, for example, the fields of environment, pollution prevention and control, public works, and sustainable development.

Learning Objectives

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

- Deal with environmental issues such as wastewater treatment and management, solid waste, air pollution and industrial and hazardous waste treatment and management;
- Find sustainable solutions for environmental issues without compromising economic development;
- Provide scientific advice for policy development and decision-making.



This specialization is a joint programme offered with the Asian Institute of Technology. See our website for specific information on the partners, programme structure and admission procedure of this option.

SPECIALIZATION IN LIMNOLOGY AND WETLAND MANAGEMENT

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 specialization 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 specialization, graduates will be able to:

- Demonstrate and apply an understanding of the physical, chemical and biological structure and associated processes of inland aquatic ecosystems;
- Design sampling strategies for cost-effective effective monitoring of aquatic ecosystems, and to support clearly stated policy objectives;
- Understand the relationship between pressures from catchment land use, invasive species and fisheries exploitation, and the ecology of lakes, rivers and wetlands;
- Integrate potentially conflicting stakeholder objectives for the sustainable use of lakes, rivers and wetlands.



This specialization is a joint programme given with BOKU: University of Natural Resources and Life Sciences, Austria, and Egerton University, Kenya. See our website for specific information on the partners, programme structure and admission procedure of this option.

SPECIALIZATION 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 specialization 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 specialization, 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 optimize 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 multidisciplinary 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.



MSc PROGRAMME IN URBAN WATER AND SANITATION

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

SPECIALIZATIONS

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. 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 Urban Water and Sanitation 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.
- Will 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 transitioning countries.
- Will be able to independently conduct academic research.

SPECIALIZATIONS

SPECIALIZATION IN SANITARY ENGINEERING

You will learn to deal with wastewater and sludge treatment process operation, maintenance and design, including urban drainage and sewerage, centralized and decentralized systems and land-based and engineered treatment plants.

Prospective Students

This specialization 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, chemical and sanitary engineers, being professionals from (wastewater) authorities, water and environment ministries, private companies, academia, NGOs and city and municipal authorities.

Learning Objectives

After successfully completing the Sanitary Engineering specialization, 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 **J** This specialization can also be taken as a Double Degree programme. One of these is offered with Kwame Nkrumah University of Science and Technology, Ghana, the other with Universidad Del Valle, Colombia. See our website for specific information on the partner, programme structure and admission procedure of these options.

SPECIALIZATION 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.

Prospective Students

This specialization 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 specialization will be able to:

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

J This specialization is a joint programme offered with the Asian Institute of Technology, Thailand. See our website for specific information on the partners, programme structure and admission procedure of this option.

SPECIALIZATION 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 specialization is designed for mid-career engineers working in water supply companies, municipal assemblies, government ministries and consulting companies dealing with water collection, storage, treatment, transport and distribution.

Learning Objectives

After successfully completing the Water Supply Engineering specialization, graduates will be able to:

- Understand the structure of drinking water supply systems, including water transport, treatment and distribution;
- Name water quality criteria and standards, and their relation to public health, environment and urban water cycle;
- Understand physical, chemical and biological phenomena, and their mutual relationships, occurring within water supply systems;
- Describe water quality concepts and their effect on treatment process selection;
- Describe the interaction of water quality and the materials being used;
- Work with hydraulic concepts and their relationship to water transport in treatment plants, pipelines and distribution networks;
- Understand the importance and methods of operation and maintenance of water supply systems;
- Develop options for centralised and urban systems versus decentralised and rural systems;
- 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.

Db J This specialization can also be taken as a Double Degree programme. One of these is offered with Kwame Nkrumah University of Science and Technology, Ghana, the other with Universidad Del Valle, Colombia. See our website for specific information on the partner, programme structure and admission procedure of these options.

MSc PROGRAMME IN WATER MANAGEMENT

Imparts knowledge and skills needed to develop, implement and critically evaluate water management policies and strategies in order to foster inclusive and sustainable use of water and achieve effective governance of water systems.

SPECIALIZATION

Water Cooperation and Peace

THEMATIC PROFILES

- Water Conflict Management
- Water Quality Management
- Water Resources Management
- Water Services 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 (water scarcity), too much water (flooding), and water of poor quality rendering it unfit to sustain aquatic ecosystems and/or containing the provision of water to people, industry and agriculture. Addressing these challenges requires that water managers apply an integrated and interdisciplinary approach, involving hydrological, biophysical, chemical, social, economic, institutional, legal, policymaking and planning aspects. The MSc Programme in Water Management provides such an integrated and interdisciplinary approach. This innovative programme brings together the scientific study of water management with training in professional skills tailored to the needs of the students. Throughout the programme students are encouraged to study water management from a multi-disciplinary perspective and to seek integrated solutions.

The MSc programme in Water Management starts with a foundation phase, in which students are familiarized with the interdisciplinary character of the water management domain. This common part of the programme includes subjects on integrated approaches in water management, key biophysical, chemical and hydrological processes, water governance and water economics. After the foundation phase the students compose a personal

portfolio that reflects their educational and professional background as well as career ambitions. As part of the portfolio students will determine their personal study profile for the remaining part of the programme, with guidance by a dedicated mentor and, if applicable, in consultation with their employer. The study profiles can be fully tailor-made based on a broad range of available courses or follow one of the thematic profiles. The thematic profiles include profiles that focus on water resources management, water quality management, water services management and water conflict management (see below for details). The programme culminates in a six months MSc research and thesis writing phase in line with the selected study profile.

Once they have successfully completed this programme, graduates will 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 use and water service provision.
- Critically evaluate technical and institutional water system interventions (e.g. projects, programmes, policies, agreements) through analysis of implications for the water system, its users and their interrelations at various spatial and temporal scales.
- Conduct, independently or in a multidisciplinary team, academic research and clearly and systematically describe the rationale for an integrated and interdisciplinary approach for managing water systems.

SPECIALIZATION

SPECIALIZATION IN WATER COOPERATION AND PEACE

You will be provided with a theoretical and historical understanding of conflict and peace dynamics and frame issues of water security and cooperation in the broader context of environmental issues, develop in depth knowledge of and skills in critical analysis of water conflicts, an understanding of socio-hydrological dynamics, decision making processes on water resources and services management, water diplomacy, water dispute prevention, management and resolution skills and tools to promote/achieve water security and to ensure dialogue and cooperation between different and competing users at various scales.

Prospective Students

Professionals, preferably with relevant work experience in the water sector, involved in planning, regulating, and managing access, allocation and control of water resources and services at various scales as well as diplomats, UN staff or other professionals working for international organizations or NGOs who deal with water issues are welcome to apply.

Learning Objectives

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

- Describe the interwovenness of socio-natural processes;
- Discuss and compare theories and dimensions of conflict and its avoidance, management and resolution;
- Critically analyse water disputes (including actors, policies, institutions, historical, social and bio-physical processes);
- Identify and analyse issues, challenges and potential conflicts of water allocation and access to water resources at different scales;
- Use an interdisciplinary approach to critically assess and evaluate the different means conflict management tools and techniques available to deal with water-related disputes;
- Apply conflict management tools and design conflict resolution processes with the aim of settling water management disputes;
- Research the selection and application of adequate methodologies and techniques of water conflict management tools and formulate well-founded conclusions and recommendations.

J This specialization is a joint programme offered with the University for Peace, Costa Rica and Oregon State University, USA. See our website for specific information on the partners, programme structure and admission procedure of this option.

THEMATIC PROFILES

THEMATIC PROFILE ON WATER CONFLICT MANAGEMENT

You will study water conflict management, particularly alternative dispute resolution processes and develop the skills required to prevent, manage and resolve water-related conflicts.

Prospective Students

The thematic profile is designed for water managers as well as for institutional, legal and international relations experts and (social) geographers interested in local, national and international water management. Graduates typically are employed by river basin organizations, public and private water utilities, municipalities, ministries, international organizations, law firms, NGOs and academia.

Learning Objectives

After completing the water conflict management thematic profile, graduates will 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;
- 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;
- Explain the key concepts for integrated, multidisciplinary and interdisciplinary analyses of water systems and describe the challenges of such approaches at sector, intersectoral and transboundary levels;
- 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.

Db

THEMATIC PROFILE ON 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 thematic profile is designed for engineers and natural 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 thematic profile. Graduates typically are employed by river basin organizations, ministries, consultancy firms, NGOs and academia.

Learning Objectives

After completing the water quality management thematic profile, graduates will be able to:

- Describe, model 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;
- 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;
- Explain the key concepts for integrated, multidisciplinary and interdisciplinary analyses of aquatic ecosystems and describe the challenges of such approaches;
- 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.

Db

THEMATIC PROFILE ON WATER RESOURCES MANAGEMENT

You will study water availability in connection to water use, 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 profile is designed for engineers, natural scientists and managers responsible for planning, developing and implementing water resources projects and programmes. Affinity with quantitative methods, such as statistical analysis, is required for this thematic profile. Graduates typically are employed by river basin organizations, ministries, consultancy firms, NGOs and academia.

Learning Objectives

After completing the water resources management thematic profile, graduates will be able to:

- Describe, model 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;
- 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;
- Explain the key concepts for integrated, multidisciplinary and interdisciplinary analyses of water systems and describe the challenges of such approaches;
- 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.

Db

THEMATIC PROFILE ON WATER SERVICES MANAGEMENT

You will study the provision of water and sanitation services as well as the management of related infrastructure and critically review institutional and financial instruments and business models considering different socio-economic contexts.

Prospective Students

The thematic profile is designed for broad range of professionals from various academic backgrounds active in the water services sector and involved in the planning, developing and managing of water supply and/or sanitation policies, strategies and programmes. Graduates typically are employed by public and private water utilities, municipalities, consultancy firms, NGOs and academia.

Learning Objectives

After completing the water services management thematic profile, graduates will 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;
- 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;
- Explain the key concepts for integrated, multidisciplinary and interdisciplinary analyses of water services management and describe challenges of providing water supply and sanitation services at different levels (from global to local);
- 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).

Db

MSc PROGRAMME IN WATER SCIENCE AND ENGINEERING

SPECIALIZATIONS

Focuses on the understanding, management and development of water resources and water flows and quality in the natural and human-influenced environment, while addressing the multidisciplinary character of human activities dealing with water.

SPECIALIZATIONS

Groundwater and Global Change - Impacts and adaptation

Flood Risk Management

Hydraulic Engineering and River Basin Development

Hydraulic Engineering - Coastal Engineering and Port Development

Hydroinformatics - Modelling and Information Systems for Water Management

Hydrology and Water Resources

Land and Water Development for Food Security

The specializations within this programme explore natural and anthropogenic influences on the water cycle, from the perspectives of civil engineering, technology and earth system sciences. They are of direct relevance to sustainable development because they prepare graduates to improve the sustainable management of human impacts on water resources, design simulation models for various phases of the water cycle, and contribute to the development of integrated solutions for reducing the impact of water-related natural hazards and other water issues.

Aim of the Programme
The programme aims to deepen the knowledge, insights and skills for Hydraulic Engineering (part of Civil Engineering and covering the disciplines River Basin Development, Land and Water Development and Coastal Engineering and Port Development), Hydroinformatics (a technology oriented discipline) and Hydrology (an earth system science). These different fields are complementary and ensure exposure of the student to a large variety of water issues from different perspectives, and the ability to develop sustainable solutions for complex water problems. Graduates are able to work in professional water sector environments that require academic skills. Graduates who obtain very good study results are eligible to undertake a PhD in an appropriate water science or engineering field.

In particular, this programme provides the education to:

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

SPECIALIZATION IN GROUNDWATER AND GLOBAL CHANGE - IMPACTS AND ADAPTATION

You will develop scientific and engineering knowledge needed to understand the interactions between groundwater, surface water, climate and global change, to consider and benefit from these interactions when dealing with adaptation.

Prospective Students

This Joint Erasmus Mundus programme is open to students with a BSc, preferably in geologic, hydraulic, civil, environmental or agricultural engineering, geosciences, environmental sciences, climate sciences, geography, geology, or any other similar subject.

Learning Objectives

Graduates of the Joint Erasmus Mundus programme in Groundwater and Global Change will be able to:

- Explain in detail how groundwater systems function;
- Describe the interactions between groundwater systems, climate, surface waters and land use;
- Use modelling tools for climate and groundwater systems;
- Identify the consequences of global and climate change impacts for groundwater management under uncertainty;
- Plan groundwater-related adaptation solutions for global change.



This specialization is a joint programme offered under the European Erasmus Mundus framework with the Technical University of Dresden (Germany) and IST Lisbon (Portugal). More information on the partners, programme structure and admission procedure is available at www.groundwatermaster.eu

Study Information

Delft-based MSc specialization

Joint programme

Joint Erasmus Mundus programme



SPECIALIZATION 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.

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.

  This specialization is a joint programme offered under the European Erasmus Mundus framework with the Technical University of Dresden (Germany), Barcelona Tech (formerly Technical University of Catalonia) (Spain) and University of Ljubljana (Slovenia). More information on the partners, programme structure and admission procedure is available at www.floodriskmaster.org

SPECIALIZATION 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 for different scales of water projects (catchments, river stretches and floodplains).



Prospective Students

Students may want to follow this specialization 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 specialization, 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.

  Alternatively, this specialization can be taken as a joint programme. Integrated River, Lowland and Coastal Development and Management Planning is given with Sriwijaya University, Indonesia.

SPECIALIZATION 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.



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 specialization, graduates will be able to:

- Explain hydraulic and morphologic coastal processes and nautical and logistic aspects as well as their interactions with near shore and offshore structures;
- Apply state-of-the-art coastal engineering design techniques to advance the needs of society for infrastructure and a safe environment;
- Evaluate and implement coastal engineering solutions in a multidisciplinary and interdisciplinary environment;
- Develop strategies to cope effectively with problems related to natural coastal hazards (e.g. flooding, oil spill) and shoreline erosion problems incorporating the tension between anthropogenic coastal developments and natural coastal processes;
- Apply hydraulic, nautical, logistic and economic theories in the planning and design of coastal and ports layout and port logistics.

  This specialization is also offered as a joint programme given with Hohai University, China. Furthermore, Integrated River, Lowland and Coastal Development and Management Planning is given with Sriwijaya University, Indonesia. See our website for specific information on the partner, programme structure and admission procedure of this option.

SPECIALIZATIONS

MSc PROGRAMME IN WATER SCIENCE AND ENGINEERING

SPECIALIZATION IN HYDROINFORMATICS - MODELLING AND INFORMATION SYSTEMS FOR WATER MANAGEMENT

You will be able to understand the main water-related processes and to develop and apply computer-based mathematical models, web-based information systems and integrated hydroinformatics systems for planning, designing or managing the aquatic environment. Typical examples of applications are: flood modelling and management, urban water systems rehabilitation, reservoir optimization, etc. You will also get acquainted with the best practices of water management, and develop skills to provide expert advice to managers and users of advanced tools.

Prospective Students

This specialization is designed for hydraulic engineers, hydrologists and water resources professionals working at water boards and other government agencies, universities, consulting firms, research institutes. The typical participant uses or advises others in the use of mathematical models, advanced computational tools, web-based information systems and integrated hydroinformatics systems for planning, designing or managing the aquatic environment. Hydroinformatics engineers participate in defining, building and supplying the computer-based tools that enable decision-makers to manage aquatic resources and the environment. They work with engineers, scientists and people from other interest groups. Typical examples of applications are: flood modelling and management, urban water systems rehabilitation and reservoir optimization.

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 This specialization can also be taken as a joint programme. One of these is offered with Hohai University, China, and another with Universidad Del Valle, Colombia. See our website for specific information on the partner, programme structure and admission procedure of these options.

SPECIALIZATION 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 apply tools, such as modelling, for the proper integration of hydrological knowledge and analysis in water resources planning and management.

Prospective Students

The target group for this specialization are people aiming to work in hydrology, river basin management, prediction and mitigation of floods and droughts, water resources assessment (quantity and quality), water supply, hydropower, land use and development, environmental survey and planning, and other related fields.

Learning Objectives

Graduates who have undertaken the Hydrology and Water Resources specialization will:

- Have 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;
- Apply and integrate relevant physical, chemical, applied mathematical, computational and earth-scientific principles and concepts;
- 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, and environmental planning and management;
- Design and conduct hydrological research and experiments independently or within a team;
- Have a thorough awareness of natural and human-induced variations of hydrological systems;
- 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 specialization is also offered as a joint programme, given with Hohai University, China. See our website for specific information on the partner, programme structure and admission procedure of this option.

SPECIALIZATION IN LAND AND WATER DEVELOPMENT FOR FOOD SECURITY

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.

Learning Objectives

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

- Explain the latest concepts and theories of irrigation, drainage, flood protection, land reclamation and consolidation technologies for sustainable development;
- Identify the cross-sectoral linkages comprehending wider aspects of society, economy and the environment;
- Apply the latest hydraulic engineering and hydrological methods in planning, design and implementation of irrigation, drainage and flood protection schemes, independently or in a multidisciplinary team;
- Evaluate alternative land and water development options for areas under different land uses and assess their technical, economic and environmental feasibility;
- Support developers, system managers and water users in the participatory development and management of irrigation, drainage and flood protection schemes for their planning, design, operation and maintenance, financing and performance assessment;
- Demonstrate knowledge and understanding of contemporary research issues in the field of land and water development.

Db J Alternatively, this specialization can be taken as a joint programme. Agricultural Water Management for Enhanced Land and Water Productivity is offered with Asian Institute of Technology, Thailand. Integrated River, Lowland and Coastal Development and Management Planning is given with Sriwijaya University, Indonesia and Advanced Water Management for Food Production is given with the University of Nebraska-Lincoln, USA. See our website for specific information on the partner, programme structure and admission procedure of these options.

ONLINE COURSES 2016

Biological Wastewater Treatment: Principles, Modelling and Design	4/Jan/16 – 3/Jun/16
Faecal Sludge Management	4/Jan/16 – 6/May/16
Urban Drainage and Sewerage	4/Jan/16 – 6/May/16
Flood Modelling for Management	1/Mar/16 – 24/Jun/16
Integrated Coastal Zone Management	1/Mar/16 – 24/Jun/16
Integrated River Basin Management	1/Mar/16 – 24/Jun/16
Service Oriented Management of Irrigation Systems	1/Mar/16 – 24/Jun/16
Water and Environmental Law and Policy	1/Mar/16 – 24/Jun/16
Ecological Sanitation	2/May/16 – 2/Sep/16
Grey Water Management, Treatment and Use	2/May/16 – 2/Sep/16
Industrial Resource Management and Cleaner Production	2/May/16 – 2/Sep/16
Modelling Sanitation Systems	2/May/16 – 2/Sep/16
Constructed Wetlands for Wastewater Treatment	1/Sep/16 – 6/Jan/17
Environmental Flows	1/Sep/16 – 6/Jan/17
Industrial Effluent Treatment	1/Sep/16 – 6/Jan/17
Partnerships for Water Supply and Sanitation	1/Sep/16 – 6/Jan/17
Solid Waste Management	1/Sep/16 – 6/Jan/17
Water Quality Assessment	1/Sep/16 – 6/Jan/17
Water Transport and Distribution	1/Sep/16 – 6/Jan/17
Governance of Decentralized Sanitation	5/Sep/16 – 6/Jan/17
Decision Support Systems in River Basin Management	19/Sep/16 – 12/Dec/16

Dates are subject to change - please check the website for updates

GRADUATE PROFESSIONAL DIPLOMA PROGRAMME

Online Courses offered by UNESCO-IHE as part of the GPDP (duration varies between 12 to 18 weeks)

Course	Sanitation and Sanitary Engineering	Water Supply Engineering*	Water and Wastewater Treatment Technology*	Flood Risk Management and Urban Water Networks*	Cleaner Production and Residuals Management*
Biological Wastewater Treatment	•		•		
Urban Drainage and Sewerage	•			•	
Surface Water Treatment*		•	•		
Faecal Sludge Management	•				•
Advanced Water Treatment and Reuse		•	•		
Flood Modelling for Management				•	
Modelling Sanitation Systems	•				
Ecological Sanitation	•				•
Grey Water Management, Treatment and Use	•				
Industrial Resource Management and Cleaner Production					•
Urban Water Systems*	•	•		•	
Experimental Methods in Wastewater Treatment*	•		•		
Groundwater Resources and Treatment*		•	•		
Constructed Wetlands for Wastewater Treatment	•		•		
Water Transport and Distribution		•		•	
Industrial Effluent Treatment	•				•
Solid Waste Management	•				•
Urban Flood Management and Disaster Risk Mitigation*	•			•	
Governance of Decentralized Sanitation	•				
Unit Processes for Surface Water Treatment*		•	•		
Problem Based Learning*	•	•	•	•	•

* New courses and tracks currently being developed - please check the website for the latest information

SHORT COURSES 2016

ENVIRONMENTAL SCIENCE

Industrial Resource Management and Cleaner Production	8/Feb/16–26/Feb/16
Water Quality Assessment	29/Feb/16–18/Mar/16
Constructed Wetlands for Wastewater Treatment	29/Mar/16–15/Apr/16
Environmental Engineering	29/Mar/16–15/Apr/16
Water and Environmental Policy Making	29/Mar/16–15/Apr/16
Nanotechnology for Water and Wastewater Treatment	29/Mar/16–15/Apr/16
Environmental Monitoring and Modelling	18/Apr/16–6/May/16
Environmental Planning and Implementation	18/Apr/16–6/May/16
Data Analysis and Modelling for Aquatic Ecosystems	17/May/16–3/Jun/16
Aquatic Ecosystems: Processes and Applications	6/Jun/16–24/Jun/16
Environmental Assessment for Water-related Policies and Developments	6/Jun/16–24/Jun/16
Industrial Effluent Treatment and Residuals Management	6/Jun/16–24/Jun/16
IWRM as a Tool for Adaptation to Climate Change	27/Jun/16–15/Jul/16
Watershed and River Basin Management	27/Jun/16–15/Jul/16
Wetlands for Livelihoods and Conservation	27/Jun/16–15/Jul/16
Solid Waste Management	27/Jun/16–15/Jul/16

URBAN WATER AND SANITATION

Surface Water Treatment I	11/Jan/16–29/Jan/16
Urban Drainage and Sewerage	11/Jan/16–29/Jan/16
Asset Management	8/Feb/16–26/Feb/16
Conventional Wastewater Treatment	8/Feb/16–26/Feb/16
Surface Water Treatment II	8/Feb/16–26/Feb/16
Resource Oriented Wastewater Treatment and Sanitation	29/Feb/16–18/Mar/16
Anaerobic Wastewater Treatment	29/Feb/16–4/Mar/16
Wastewater Treatment Plants Design and Engineering	29/Mar/16–15/Apr/16
Water Transport and Distribution	29/Mar/16–15/Apr/16
Advanced Water Treatment and Re-use	18/Apr/16–6/May/16
Modelling Wastewater Treatment Processes and Plants	18/Apr/16–6/May/16
Partnerships for Water Supply and Sanitation	6/Jun/16–24/Jun/16
Urban Water Systems	6/Jun/16–24/Jun/16
Water Treatment Processes and Plants	6/Jun/16–24/Jun/16
Advanced Water Transport and Distribution	27/Jun/16–15/Jul/16
Decentralised Water Supply and Sanitation	27/Jun/16–15/Jul/16
Faecal Sludge Management	27/Jun/16–15/Jul/16

WATER SCIENCE AND ENGINEERING

Port Planning and Infrastructure Design	11/Jan/16–29/Jan/16
Coastal Systems	8/Feb/16–26/Feb/16
Coastal and Port Structures	29/Feb/16–18/Mar/16
Groundwater Resources and Treatment	29/Feb/16–18/Mar/16
Tracer Hydrology and Flow Systems Analysis	29/Feb/16–18/Mar/16
Hydropower water conduit design	7/Mar/16–18/Mar/16
Groundwater Data Collection and Interpretation	29/Mar/16–15/Apr/16
Hydrological Data Collection and Processing	29/Mar/16–15/Apr/16
River Basin Modelling	29/Mar/16–15/Apr/16
Integrated Hydrological and River Modelling	18/Apr/16–6/May/16
International Port Seminar	18/Apr/16–6/May/16
River Flood Analysis and Modelling	18/Apr/16–6/May/16
Management of Irrigation and Drainage Systems	18/Apr/16–6/May/16
Urban Flood Management and Disaster Risk Mitigation	18/Apr/16–6/May/16
Integrated Coastal Zone Management	18/Apr/16–29/Apr/16
Applied Groundwater Modelling	6/Jun/16–24/Jun/16
Flood Risk Management	6/Jun/16–24/Jun/16
River Restoration and Rehabilitation	6/Jun/16–24/Jun/16
Design of Hydropower Schemes	20/Jun/16–24/Jun/16
Water Sensitive Cities	27/Jun/16–15/Jul/16
Flood-based Farming Systems and Water Harvesting for Food Security	5/Sep/16–16/Sep/16
Data Acquisition, Preprocessing and Modelling using HEC-RAS	12/Sep/16–23/Sep/16
Data Acquisition, Preprocessing and Modelling using PCRaster Python	12/Sep/16–23/Sep/16
Data Acquisition, Preprocessing and Modelling using SWAT	12/Sep/16–23/Sep/16
Small Hydropower Development	12/Sep/16–23/Sep/16
Morphological Modeling Using Delft3D	12/Sep/16–16/Sep/16
Open Source Software for Preprocessing GIS data for Hydrological Models	12/Sep/16–16/Sep/16
Environmental Modelling using PCRaster	19/Sep/16–23/Sep/16
River Basin Modelling using HEC-RAS	19/Sep/16–23/Sep/16
River Basin Modelling using SWAT	19/Sep/16–23/Sep/16
GIS and Remote Sensing Applications for the Water Sector	24/Oct/16–4/Nov/16
Where there is little data: How to estimate design variables in poorly gauged basins	31/Oct/16–11/Nov/16

WATER MANAGEMENT

Water Economics	11/Jan/16–29/Jan/16
Water and Environmental Law	8/Feb/16–26/Feb/16
Computational Intelligence and Operational Water Management	18/Mar/16–29/Feb/16
Managing Water Organizations	29/Feb/16–18/Mar/16
Water Conflict Management I	29/Feb/16–18/Mar/16
Water Resources Assessment	29/Feb/16–18/Mar/16
Water Conflict Management II	29/Mar/16–15/Apr/16
Financial Management of Water Organisations	18/Apr/16–6/May/16
Water Resources Planning	18/Apr/16–6/May/16
Urban Water Governance	27/Jun/16–15/Jul/16

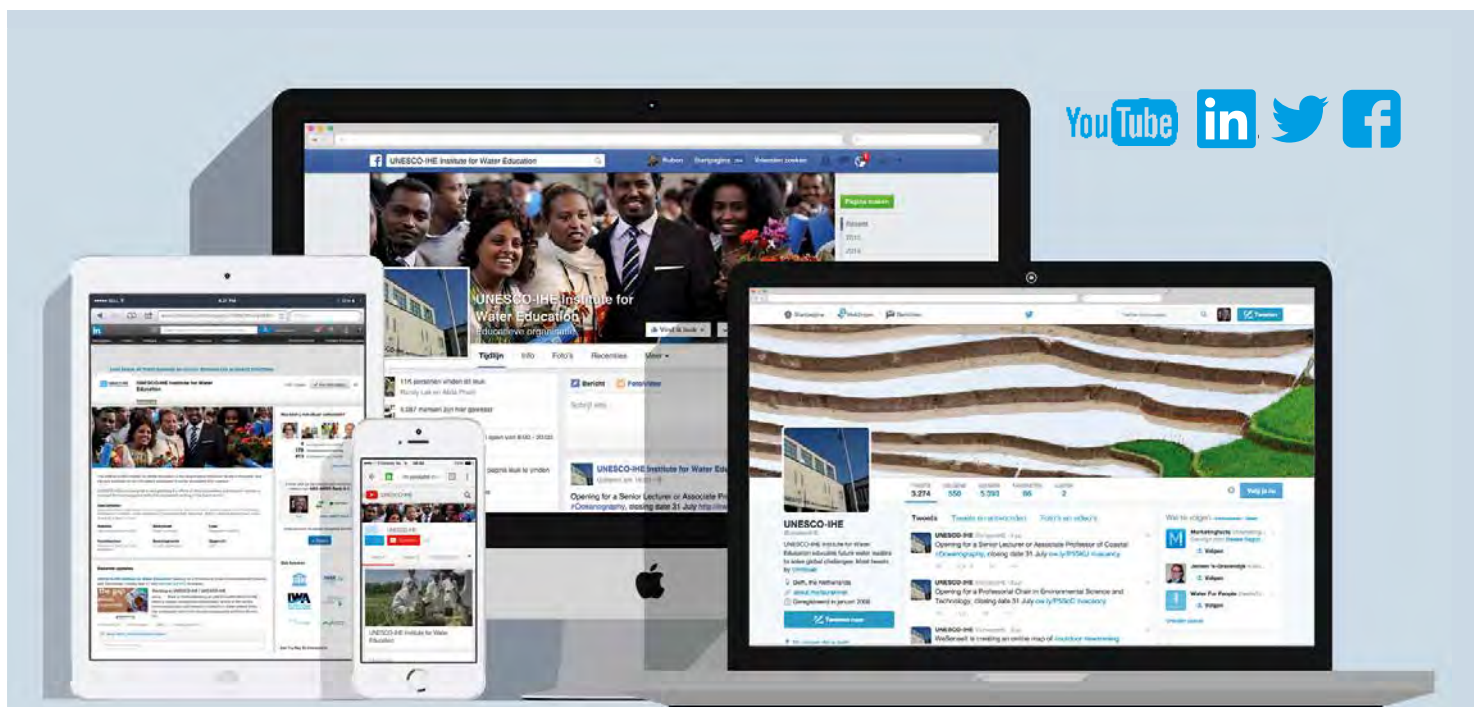
Dates are subject to change – please check the website for updates

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