

**Faculty of Science**

# **Prospectus 2010 - 2011**

**Environmental Sciences**

Master

**Radboud University Nijmegen**

# Preface

This text contains information about the masters programme Environmental Sciences of the Faculty of Science. It contains information about objectives, the goals and the contents of the programme. Furthermore a lot of practical information is given.

All general information for students regarding the university, accommodations-living-well-being, finances, student grants and loans, admission and registration, services provided, student facilities, associations and organisations for students, student and legal position (students' statute) and moreover, all of the useful addresses and telephone numbers can be found on [www.ru.nl/students](http://www.ru.nl/students)

The Educational Institute Biosciences observes the privacy regulations and will therefore not make any personal particulars public.

This information is mainly meant as an aid for the student. If, upon using, something is not clear to you or proves to be incorrect, or if you have any suggestions, please report this to the educational advisor or the office of BioSciences.

This information has been composed with great care. However the author is not responsible for inaccuracies. If you have comments or proposals for improvement don't hesitate to contact her.

Mrs H.W.J. Becks MSc

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# 1 General Information

## 1.1 Introduction

'How do pesticides end up in the food of humans and animals and what are the risks?' 'What are the risks for those who live in the vicinity of an industrial estate?' 'Is a car that runs on hydrogen more environmentally friendly compared to one that runs on petrol?' 'What will happen to an important natural area like the Wadden Sea if the climate in the Netherlands changes and the sea level rises?'

These are all questions to which we want answers!

Environmental scientists are concerned with questions of this kind and try to find answers. Environmental Science is the discipline concerned with the study of environmental problems with a view determining how to go about solving these problems or, even better, preventing them.

Environmental problems are quite complex and they require a multidisciplinary approach. Consider, for example, the problem of water pollution. It involves various environmental aspects, such as excessive algal growth, the toxic effects of poisonous substances, the effectiveness of sewage treatment plants, the benefit of sewerage charges, granting discharge permits, et cetera. In order to come to a solution, you have to look at the problem from various scientific angles. The sections of these separate areas of research that focus on environmental research are environmental specialisms. These include biology, chemistry, physics, law, economy, geography and the biomedical sciences. These specialisms conduct research into environmental problems and subsequently contribute to understanding the issues at hand.

And so, in solving the problems, it will not suffice to have various disciplines focus on the same problem. They must also combine all of their knowledge in order to reach an overall solution to environmental problems. Environmental Science is the field of science that focusses on this integration. It aims to develop concepts and models that enable this integration.

## 1.2 Organisation Environmental Sciences

### Admittance

The programme requires a Bachelor degree in Environmental Sciences from the University of Nijmegen or Utrecht, or an equivalent degree. For example a bachelor degree in Biology, Physics, Natural Sciences, Chemistry or Biomedical Sciences from any Dutch university qualifies.

Foreign students' prior education must meet certain requirements. First and foremost, the foreign certificate, on the basis of which you seek admission, must be at least the equivalent of a Dutch Bachelor's degree obtained at a university (BSc). Those who have a Bachelor's degree from an university of professional education are not always admitted straight away. In most cases they first need to follow a special bridging programme (schakelprogramma) to improve their knowledge of the scientific field before they can gain admission to the Master's programme. For more information see Enrolment and books and Appendix 5.

## **Aims and attainment targets**

### **Aim**

The field of study of Environmental Science is so extensive, that one cannot thoroughly master all of the aspects involved. And so you must specialise. Environmental Sciences focuses on generating environmental scientists who have a clear view of how other (scientific) disciplines can contribute to solving environmental issues, in addition to having completed extensive (specialist) training in one of the scientific disciplines (biology, chemistry or natural science).

The master Environmental Sciences (ES) aims to have the graduate gain insight into and acquire knowledge of the field of environmental science in such a way that he/she can independently practise his/her profession and will qualify, if desired, for advanced training in scientific research or designing.

### **Final attainment levels Master Environmental Sciences**

The competences that apply to the Master ES are stated below.

#### *Researcher- design*

Based on up-to-date scientific knowledge, insights and skills, a master of Environmental Sciences is able to independently describe complex environmental science issues and can reduce these to a verifiable question.

#### *Researcher - executing and interpreting/analysing*

A master of Environmental Sciences can independently apply scientifically sound research methods, techniques and research instruments upon analysing a complex environmental science issue presented by a commissioning party.

He/she designs and carries out the research, processes and interprets the results, draws unambiguous conclusions based on these and formulates relevant recommendations concerning subsequent research, environmental policy and/or environmental management.

#### *Communication*

A master of Environmental Sciences presents, reports and communicates the results and implications of environmental science research in national and international level, both independently as well as in a mono-disciplinary, multi- or interdisciplinary team of colleagues and/or non-colleagues and/or stakeholders.

#### *Interdisciplinary researcher*

A master of Environmental Sciences can interpret the position of Environmental Sciences with respect to other natural sciences. In addition, he/she has adequate knowledge of and insight into the organisational, legal and policy aspects of environmental issues as a result of which he/she, both independently and as a member of an interdisciplinary team, can contribute in a relevant and innovating fashion to the process of analysing and solving complex environmental issues.

#### *Personal effectiveness - Learning process*

A master of Environmental Sciences can independently and critically reflect upon his/her

own individual actions, the resulting consequences and his/her position as a professional in society. He/she answers in that respect for the choices made and, in the professional context in which he/she operates, directs his/her personal development in terms of competences and the accompanying learning process.

#### *Personal effectiveness - Reasoning*

A master of Environmental Sciences can critically apply scientific and environmental methods of reasoning and can define a position with respect to a scientific line of reasoning that concerns his/her field.

#### *Specialist*

A master of Environmental Sciences integrates new knowledge and insights from various scientific sources of information, drawn up in English, with existing scientific knowledge and insights.

### **Structure of master programme**

All of the faculties of the RU Nijmegen have implemented the bachelor-master structure. As the same structure is being implemented in most European countries, it is easier to adequately compare the academic institutes. The academic training Environmental Sciences consists of two components:

- Bachelor
- Master

*The bachelor* takes three years. The bachelor programme is broadly-based in Biology, Chemistry or Physics and has prepared you for the master training in Environmental Sciences. You have received a bachelor's degree upon successfully completing the bachelor programme, with the title of 'Bachelor of Science' (BSc).

*The master* takes two years. During this phase, you will specialise in a certain field of study within environmental sciences. The master includes two traineeships. You will receive a master's degree upon successfully completing your studies, with the title of 'Master of Science' (MSc).

### **Clustering**

The training courses within the Faculty of Science are clustered. As the courses within a single cluster work together, the interrelationships become clear. The clustering also aims to allow for a quick switch-over to a different training course within the same cluster. Environmental Sciences is part of the cluster of *Biosciences* (biology, medical biology and environmental sciences)

### **The Master**

This is the period of two years during which you specialise in a certain area within Environmental Sciences. The Master programme consists of various components:

- Courses
- Environmental Science research traineeships
- Individual options

You will graduate in one of the following main orientations:

- Research (R-orientation)
  - Differentiation Human and Environmental Risk Assessment (HERA)
- Management and Technology (MT-orientation)
- Communication (C-orientation)
- Education (E-orientation)
- Transnational ecosystem based Water Management (TWM).

#### *Traineeships*

Your master includes a number of traineeships, varying in duration from 6 to 9 months.

Depending upon the orientation of your choice, you are to complete one or two environment specialisation and/or environment-related (research) traineeships.

- During the environment specialisation research traineeship, you are to conduct biological, physical or chemical research concerning an environmental issue.
- During your environment-related traineeship, you are to conduct research on the basis of an environmental question and you attempt to consider scientific research in a broader scope and to translate the research into aspects concerning nature conservation and environmental management.

#### *Individual options*

The master training includes individual options. You can use these options to gain more in-depth knowledge of certain environment-related subjects or environmental specialisations, but you may also opt to broaden your knowledge. You can do so by completing courses, by extending your traineeship or by completing an extra (profession-oriented) traineeship.

### **EC credits**

EC credits are observed for both the Bachelor as well as the Master programme. This is the so-called European Credit Transfer System, an international credit system that expresses the scope of training courses. One academic year stands for 60 ECs. A 40-hour working week corresponds to 1.5 ECs. This means that a 6-ECs module involves (on average) four 40-hour working weeks.

The three-year Bachelor training is the equivalent of 180 ECs (3 x 60 EC's). The two-year Master is the equivalent of 120 ECs (2 \* 60).

### **Organisation BioSciences**

#### **Educational institute and Research institutes**

The Educational Institute of Biosciences is responsible for the course of events regarding the available courses of the academic educations that it provides. The university professors that contribute to the training courses can be found at both the various Research institutes of the Faculty of Science as well as at the nearby University Medical Centre St. Radboud.

There are two research institutes that are strongly attached to the Educational Institute of Biosciences and the master training Environmental Sciences, namely the IWWR (Institute for Wetland and Water Research) and ISIS (Institute for Science Innovation and Society).



## The education department

This department consists of: the head of the Educational secretariat, the educational advisors, the training co-ordinator and the secretarial office. It is the responsibility of the Education department to co-ordinate the curriculum and to provide information on the academic training and recommendations concerning one's studies.

The department also has a supporting role where it concerns the policy of the Educational Institute, which is defined by the Director of the Educational Institute, the Collective Faculty Meeting and the training committee.

The director of the Biosciences cluster is Prof. Dr. G. Flik. Each academic education within a cluster is headed by a co-ordinator. The co-ordinator of Environmental Sciences is Prof. Dr. Ir. A.J. Hendriks.

*The staff members of the education department of Biosciences:*

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### **Center for Sustainable Management of Resources (CSMR)**

The Center for Sustainable Management of Resources (CSMR) is an interdisciplinary department that focuses on the Beta-Gamma aspects of Sustainable Development, Water and Environment. The centre has three objectives; education, research and service to the society. You can find more information about our education program on: <http://www.ru.nl/cmsr>

In addition, the CSMR ensures that the environmental expertise of the RU is adequately communicated to the government and the (international) business community. The CSMR also mediates in finding (inter-faculty) traineeships and supervisors.

Secretariat CSMR:

mrs. V. Jansen, e-mail: [v.jansen@science.ru.nl](mailto:v.jansen@science.ru.nl)

Faculty of Science

Room HG.02.802

T: 024-365 22 62

### **Information and Counselling**

#### *Information and Counselling*

You may run into all kinds of problems during your studies as a result of which you may need advice or counselling. Problems concerning your enrolment, finances, preliminary exams and exams, the subjects of your choice, exemptions and applying for exams, et cetera.

The prospectus and other sources of information such as the instructors and the teaching assistants can answer many of these questions. However, you may be left with specific questions. If such is the case, you should not hesitate to call upon one of the educational advisors. In such cases, you would do best to set up an appointment with the educational advisor/training co-ordinator Marlie Becks. She is also available for specific questions concerning the progress of your studies (T: 024-3653285; e-mail [m.becks@science.ru.nl](mailto:m.becks@science.ru.nl)). You can contact her on Mondays, Tuesdays and Thursdays. Depending upon the issue at hand, the educational advisor may opt to refer you to some other person or department:

- the student counsellor, when you have questions or problems concerning, for example, student grants, special facilities, et cetera.
- university doctor or university psychologist, in the event that the progress of your studies is being impeded by physical and/or psychological symptoms.

#### *Help from students' association*

In addition to the academic guide and the educational advisor, your fellow students are of course the ideal walking encyclopedia. Many students are a member of Milieuprisma and the BeeVee. As a student of Environmental Sciences, you can join both.

### **Students' associations and organisations**

#### **Students' association: Milieuprisma**

Milieuprisma is an association for and of environmental scientists in Nijmegen that was established in 1989. Milieuprisma is derived from the words 'milieu' (= environment in

Dutch) and 'prisma' (= prism in Dutch), which in this case refers to the network of the environmental disciplines: social-scientific, policy-oriented and environmental sciences. Milieuprisma is active both at the Faculty of Science as well as at the Faculty of Management Sciences. The inter-faculty nature of our association stimulates the exchange of knowledge and offers something extra, as you learn to look beyond the boundaries of your own field. This association also aims to generate and strengthen social contacts.

Each year, Milieuprisma organises a weekend, various social gatherings, lectures, conferences, et cetera. The 'Prismazine' is published around every two months. Besides being a regular member, you can also be an active member of Milieuprisma, which is not only fun but instructive as well.

In short, Milieuprisma offers you the opportunity to relax and to organise and participate in activities in addition to studying. You will find us in the canteen of the Faculty of Science and in the 'prisma room' at the faculty of management sciences. Feel free to drop by at the Prisma room for more information, call us or mail to:

Prisma room: Thomas van Aquinostraat 5.00.3  
 P.O. Box 9108  
 6500 HK Nijmegen  
 T: 024-3616107  
 E-mail: milieuprisma@fm.ru.nl  
 Internet address: <http://www.ru.nl/milieuprisma>

### **Students' association: The BeeVee**

The Biologists' Association Nijmegen (BeeVee) is *the* students' association of bioscientists at the Radboud University. It was established on April 25, 1985. If you study biology, medical biology or environmental sciences, then the BeeVee is the perfect students' association for you! It is broadly-based and currently has approx. 350 members, offering something for everyone. Both for members who wish only to participate in the activities, as well as for members who want to actively dedicate themselves to one of the many committees that the BeeVee has. Incidentally, these committees always welcome new members with refreshing ideas. If this appeals to you, then visit <http://www.beevee.nl>. There you can read all about the committees. But the site also provides information on schedules, required reading lists and the like. And should you have ideas for improvements, then the website committee can always use a helping hand.

The executive committee of the BeeVee consists of 7 people, they run the association, ensure its continuity, see to daily odd jobs and guide the other committees. They try to be of service to every student. The aim of the association is to promote the interests of the student in the broadest sense of the word. For example, selling books at considerable discounts, social gatherings, parties, but also symposia, (cultural) excursions, sports and games. All in all, there is plenty to do with your spare time. If you have any questions, then please feel free to mail us:

[beevee@science.ru.nl](mailto:beevee@science.ru.nl) or call: 024-3652537.

Room: HG 00.120 (12.45h-13.15h on working days)

A membership costs €5,- per year. If you become a member during your orientation week, you can opt to pay €20,- and to remain a BeeVee-member for the duration of your studies.

### **The Beta Career Fair Foundation**

Students are more familiar with this foundation under the name BBB. The BBB organises activities for students of all of the various disciplines that make up the Faculty of Science and of course for affiliated disciplines as well. This organisation consists of students from these disciplines (should you be interested: we always consider reinforcements). The BBB organises a large-scale annual fair and a number of small-scaled activities throughout the year.

The *BBB-Career Fair* helps master students and PhD-students upon venturing onto the job market and when applying for positions. The fair is held at the Faculty of Science each spring in the month of May. As numerous organisations are represented, all of which focus on part of our target group, the fair offers a great diversity of companies.

They present themselves by way of stands and lectures. You can speak with recruiters and collect information. What's more, senior students and master students can present their CVs online on the BBB website before, during and right after the fair. In this way, they stand a chance of being invited to the companies during the BBB-DiscussionDays. These are held a few weeks after the fair. They offer the opportunity for an introductory talk or a job interview. The chance of having the opportunity for a talk is generally higher in this case compared to applying for a vacancy or sending in an unsolicited application.

The fair is known for its informal atmosphere and the excellent service that is offered the visitors. For example, they receive the BBB-Career Book that contains descriptions of the companies. Moreover, the admission is free and they need not register beforehand.

#### *BBB-WorkShops*

Four workshops are organised prior to the fair. The themes vary each year, but they all provide the visitor with extra baggage for the job market. They may concern job interview training courses and case studies, but also subjects that are more light-hearted. The address of the organisation is:

Heyendaalseweg 135

T: 024-3652388

Internet address: <http://www.bbb.science.ru.nl/>

E-mail: [bbb@science.ru.nl](mailto:bbb@science.ru.nl).

### **Enrolment and books**

#### *Enrolment at the RU*

The Central Students administration sees to the enrolment of all RU-students. Prior to the beginning of each academic year, every student who has enrolled receives a re-registration form. In order to receive your student card in time, it is best to return this completed form before July 15th. As it will be busy at the Desk, particularly at the beginning of the academic year, we recommend that you send in the re-registration form per post. Be sure to sign the registration form. Your enrolment is not valid otherwise. You will generally receive your student card an average of 6 weeks after having sent in the registration forms. More information regarding enrolment is provided in the 'Vademecum'. The Handbook that contains also the Student statute. You can arrange for the discontinuation of your enrolment at the Examinations department following graduation.

*Intake of students with a professional education (in Dutch: HBO) in the master environmental sciences (ES)*

Students with a professional education and a scientific (e.g. (medical) biology, physics, chemistry) or environmental sciences background can be admitted to Environmental Sciences. There is no official bridging programme, but rather 'made-to-measure' transfer package is set up for the student. See also the appendix 'Admission criteria and rules for the MSc programme ES'.

You are to request the permission of the examination committee before you can transfer from your professional education to the master of Environmental Sciences. Depending upon your background, you may have to take a number of subjects from the last two years of the bachelor-programme of Environmental Sciences. Roughly, you will have to follow a 2-2.5 year programme (about 150 credits) after your BSc in a professional education before obtaining your master's degree in Environmental Sciences. Most courses of the bachelor programme are in Dutch!!

In order to explore your possibilities, contact the educational advisor of Environmental Sciences, Marlie Becks (T: 024-3653285, e-mail: m.becks@science.ru.nl).

*Registration for courses*

You are to register for each module separately. You can register electronically via Blackboard up to not later than one month prior to the start of the module. When you register for a course you are automatically registered for the exam (not for a re-exam! See below)

*Procedure registration of students from outside the RU*

All university students that follow parts (modules, traineeships) of the Environmental Sciences programme are required to enrol at the RU so as to be officially registered. The student will then receive a student number of the RU. This is necessary in order to record the marks received for the parts followed. If the student is already registered at some other university, then he/she does not have to pay tuition fees a second time. The student is to register as a subsidiary student.

The student has to apply at the Office of Student Affairs, Comeniuslaan 4; T: 024-3612345. The Office of Student Affairs will then send the student a registration form that is to be completed and returned as soon as possible. Upon enrolment after October 1st and before May 1st, the student must also send in a form that includes a statement from the training coordinator of ES to confirm that the student has permission to follow part of the programme. This form is to be sent in along with the registration forms. You cannot enrol in the current academic year after May 1st. If problems occur, then you can contact the educational secretariat of Biosciences.

*Faculty students administration*

The Faculty Students administration (FSA) is located on the ground floor, room HG 00.134.

Staff members:

Ms. Y.E.P.M.M. Mulder-Nijis

Ms. C.M.A. Hendriks

Opening hours for students:

Monday through Thursday from 13.00h - 16.00h

Friday from 09.00h - 12.00h

You are to report the following to the FSA/Examinations department as soon as possible:

- change of address (both study address and holiday address)
- termination or interruption of your studies
- a change in branch of studies
- confirmation of an extension of your registration period.

#### *Registration re-exams*

You are to register electronically via KISS for each re-exam.

If you have not registered for a re-exam, then you will not be allowed to take part.

Registration is to take place not later than 5 working days before the date of the re-exam. If you have problems with the electronic registration, then you can contact the secretariat of the Faculty Students administration.

#### *KISS (RU Internet Students Service)*

KISS includes a range of Internet services for students at the RU. Every RU-student has access to KISS. Among other things, KISS allows you to view your own preliminary exam results, to register for study groups and preliminary exams, to change your address, receive and send e-mail, to create your own webpage and to gain access to the Internet by phoning in. In addition, the monthly newsletter is also sent to all RU students through KISS. It states all kinds of important news items that concern the RU. You will receive information on your KISS-account together with a personal inlog code at the beginning of your first year. You are to change this inlog code into a password the first time that you log in. If you lose your password, then you can request a new one at the Student Affairs Desk upon presenting your student card. You will find the KISS-programme on the Internet via <http://www.student.ru.nl/>. If you wish to access the Internet through the RU, then you can collect the CD-Rom Surfkit at the Desk for the installation of your dial-up connection. Contact the Desk if you have any questions or problems concerning your KISS-account. You can also send an e-mail to: [helpdesk@student.ru.nl](mailto:helpdesk@student.ru.nl).

#### *Logins and e-mail addresses*

Two logins apply:

- a faculty science.ru.nl-login, for access to Faculty of Science computers, such as terminal rooms, STAP work stations, login-server studs, [@science.ru.nl](mailto:@science.ru.nl) mail and the Faculty of Science dial-up service.
- a university student.ru.nl-login, for access to KISS with [@student.ru.nl](mailto:@student.ru.nl) mail and the RU dial-up service

Do you have any questions or problems?

Contact the helpdesk / Student Affairs Desk for questions concerning KISS and the [student.ru.nl](mailto:student.ru.nl) e-mail address.

Contact C&CZ Systems Management for questions concerning the computers at the Faculty

of Science and the science.ru.nl e-mail address. You can also send a mail to them: [postmaster@science.ru.nl](mailto:postmaster@science.ru.nl).

### *Purchasing books*

Master students don't need many books. Most courses have all the information you need on Blackboard.

Students can order books via the BeeVee. This is the students' association for the students of Biosciences. The BeeVee distributes order forms during lectures. You can indicate on this form whether you wish to order books through the association. You are to make a down payment in the amount of €25,- for each book that you order. You can collect the books that you order at the BeeVee-room (HG 00.120, working days between 12.45h and 13.15h). Contact the BeeVee-room if you have any questions.

### **The job market**

Upon completing your education, you will qualify for various positions on the job market. The area of specialisation as part of your academic education, the subjects that you choose and the orientation of your choice (research, communication, education, or management and technology) all strongly determine the tasks involved in your future position. The job market and the support offered upon venturing upon this market are discussed below.

#### *Job market*

The educational institute of Biosciences has detailed information at its disposal concerning the careers of its graduates. Surveys of the graduates are held on a regular basis. One of the aspects of these surveys concerns the employers where the graduates have found a position. A survey (dated March 2006) of the graduates from the period 2000-2005 shows that 97 percent of the graduates hold paying positions.

The graduates from the period 2000-2005 are employed by consultancies (38%), university institutions (13%), research institutions (13%), the business community / industry (13%), the national government (8%) and Water Board (8%). Furthermore approx. 8 % of the graduates works at provincial or local authorities and cooperative body of municipalities.

Relevant positions include advisor, project staff member, research assistant (AIO) / trainee research worker (OIO), researcher, policy staff member or project manager. All in all, 42 percent of the positions are oriented towards environmental management (including soil management, environmental impact assessment, quality protection, health and safety and environmental protection), 25 percent is oriented towards water management (including safety and urban water management).

Approx. 12 percent hold positions that concern nature conservation and approx. 12 percent hold positions that involve a combination of environmental/water management and nature conservation. The remaining graduates (8%) fulfil positions that are not exclusively oriented towards the environment. There are scarcely any graduates who move on to areas that are not 'environment-related', such as the Information and Communication technology (ICT) sector. You can find information on the positions held by graduates in the 'Who's who' guide of the department. The who's who guide is available at the alumni department of the RU Nijmegen, Comeniuslaan 6.

#### *Support upon venturing upon the job market*

Whether or not you find a suitable position will largely depend upon your own initiatives.

There is a vacancy notice board in the hall outside the department of Environmental Science. Here you will find vacancies for environmental scientists. The department is often notified of vacancies that are then sent on to suitable candidates. The Environmental Sciences institute plays an active role in finding suitable positions. Studies show that approx. 20 percent of the graduates have found a job through the mediation on the part of a staff member of the institute. There are also other agencies that can help you on your way. Of course, you can always visit the regional employment office. In some cases, they can advise or guide you in finding work. In addition, there are also a number of temporary employment agencies that mainly focus on positions within the environmental sector.

The university also undertakes activities in this respect. For example, the Information Centre for Student Affairs of the university regularly organises training courses for job applications/interviews. Contact the centre for additional information (T:024- 3612345).

The Department of Environmental Science is extremely interested in the experiences of its former students on the job market. We would therefore be very appreciative if you would keep us informed of any changes of address and of the position that you hold once you have completed your studies. This will enable us to have the academic training link up with the job market as much as possible and to adequately inform new students on the situation of graduates on the job market.

#### *Former students' association*

The former students' association of Environmental Sciences was set up in the course of 1997. The alumni department of the RU sees to the administration, the co-ordination and offers activities and facilities. The former students' association usually organises an activity once every year. Students are also welcome to participate. The association, in co-operation with Environmental Sciences, is considering organising training courses and creating traineeship posts for present students. The first who's who guide with information on graduates and their field of work was published in September 1999.

### **1.3 Organisational structure RU-Faculty of Science**

#### **Organisation RU - Faculty of Science**

##### *Organisation RU*

The Radboud University Nijmegen is not a government institution, but rather an organisation for education and research in the form of a foundation. The administration of the foundation is formally the highest governing body. The tasks in the sphere of academic training and research are carried out in the faculty. The Faculty of Science (FS) is one of the 8 faculties that make up the university of Nijmegen.

##### *Organisation Faculty of Science*

The faculty offers the following master programmes: biology, medical biology, environmental sciences, physics and astronomy, chemistry, mathematics, information technology, information science, bio-information technology, cognitive neuro-science, natural sciences, nanoscience & technology, and molecular life sciences. Most of the academic programmes are classified in one of the following 4 clusters.

- Cluster Information technology, Information science, Bio-information technology



- Cluster Biology, Medical Biology and Environmental Sciences
- Cluster Chemistry, Natural Sciences, Molecular Life Sciences
- Cluster Physics and Astronomy, Mathematics

The faculty is led by the chairman of the faculty. He/she is assisted by two vice-chairmans. The faculty administration is made up of the chairman of the faculty, the two vice-chairmans and a student assessor.

The Faculty of Science has a division committee (DC) in which 15 staff members serve and a Faculty Student Counsel (FSC) in which 6 students serve. The DC and the FSC consult with one another in the Faculty Collective Meeting.

### **Office of Student Affairs**

Do you have questions concerning your enrolment at the university or is the progress of your studies in a deadlock? Would you like to know more about the regulations of student grants or are you looking for cultural student activities? The staff at the Office of Student Affairs can help you on your way in the sphere of students' administration, students' counselling and cultural activities. The central student facilities of the Office of Student Affairs are discussed below per theme.

The central access to the Office of Student Affairs is the Desk. Here, you can obtain information concerning the student counsellors, the university psychologists and the Studies and Career Advisory Group. In addition, you can set up an appointment with a student counsellor or university psychologist or register for a studying skills course. The desk is furthermore for the purpose of answering your questions concerning your enrolment/deregistration at the RU, for information on and applying to the Graduation fund or Emergency fund, for reporting a delay in your studies due to exceptional circumstances, for basic information on student grants, for registering for your examination through the Examination department of the A-Faculties and for various pamphlets, forms and brochures. The KISS-Helpdesk can be found at the Student Affairs Desk as well.

The Desk is open daily from 10:00h to 17:00h, with the exception of the first Friday afternoon of each month. The address of the Desk is Comeniuslaan 4 on campus. The staff of the Desk can be reached per telephone from 8:30h to 12:30h and from 13:30h to 17:00h via tel. 024-3612345. You can also mail your questions via address [balie@dsz.ru.nl](mailto:balie@dsz.ru.nl). You can furthermore find Student Affairs on the Internet via <http://www.ru.nl/studentenzaken>.

#### *Student counsellors*

The student counsellors can help you with questions concerning laws and regulations. The counsellors provide advise in the event of problems with, for example, your finances, illness, the discontinuation of your studies, problems with student grants, your housing situation or because you feel unjustly treated with respect to a preliminary exam or other exam. A delay in your studies is to be reported to the student counsellor as well. A student counsellor furthermore acts as the permanent contact for top-class sportsmen and -women that are enrolled at the RU. The various student counsellors each have their own specialism, for example for students with a functional disorder or a foreign preparatory training.

The counsellors are required to observe confidentiality towards third parties.

You can set up an appointment with a student counsellor at the Desk. In addition, you can

speak with a counsellor per telephone on working days from 9:00h until 10:00h and from 16:00h until 17:00h via tel. 024-3612345.

#### *University psychologists*

You can see the university psychologists for problems concerning your studies. If, for example, you have problems with your concentration or you suffer from anxiety before exams, then it may help to set up an appointment with a university psychologist. You can also call upon one of the psychologists to discuss any other personal problems that impede your studies, such as depression or social insecurity. You need not be in deep trouble before setting up an appointment with a university psychologist. The psychologists are also available for personal issues that may seem relatively simple.

Following an initial interview, individual or group therapy is available. In some cases, the psychologist may refer you to some other therapist or institution. The initial interview alone may prove sufficient for information, advice or mediation. You can set up an appointment with the university psychologist via the Desk. In addition, you can speak with a psychologist on working days from 8:30h until 9:00h and from 12:00h until 12:30h per telephone via tel. 024-3612345.

#### *Confidant and Complaint committee Inappropriate Behaviour*

Two university psychologists act as confidant for students regarding Inappropriate Behaviour. You can call upon them in the event that you experience sexual intimidation, discrimination, aggression and violence, pestering and tormenting. You may decide whether you wish to speak with a female or male confidant. You can set up an appointment with a confidant at the Desk. If the intervention on the part of the confidant offers no solution, then you can file a complaint with the university Complaint Committee. You may opt to do so right away as well. Complaints are to be filed in writing within two years after the inappropriate behaviour took place. This term does not apply if the behaviour involves a punishable act. The Complaint Committee, in which a student has a seat as well, will examine the complaint and will hear both the complainant as well as the accused. The inquiry will be completed within six weeks after receiving the official complaint. The committee will report to the Board of Governors within two weeks at most and will recommend measures, if any. The Complaint regulation is included in the Student statute as appendix 9 of the '*Vademecum*'. A pamphlet with additional information is available at the Info-theque Student Affairs and the Confidant. The address for formal complaints is: Secretary Complaint Committee Inappropriate Behaviour RU, P.O. Box 9102, 6500 HC Nijmegen. You are to state 'personal' on the envelope.

#### *The 'SLAG': Studies and 'Loopbaan' (=Career) Advisory Group*

You can call upon the staff of the SLAG for questions, advice and counselling concerning your studies and career. The Info-theque, the trainers, the study/careers advisors and the Service centre for the Higher Educated work closely together in the SLAG so as to advise and assist you as much as possible.

#### *Info-theque*

The Info-theque offers all kinds of information and documentation on the academic educations inside and outside the RU, on the job market and on studying and doing traineeships abroad. The Info-theque also has excellent computer facilities for the purpose of

finding information (using special search engines, if desired) on the Internet. The Info-theque is open on working days from 11:00h to 17:00h. You can also reach the staff of the Info-theque per telephone: 024-3612975 or via e-mail address [infotheek@dsz.ru.nl](mailto:infotheek@dsz.ru.nl).

#### *Study/careers advisor*

If you have doubts concerning your current studies or if you are considering discontinuing your academic education, then you may consider alternatives by means of an exploratory study that is conducted by the study/careers advisor. You can examine your possibilities based on your preliminary education or the subjects that you have chosen and/or where your interests lie. You can also consult with the advisor if you cannot choose between two academic educations or if you doubt that a certain alternative is feasible. What's more, you can consult with the advisor for questions regarding your choice of subsidiary subjects, preparing for the job market, re-education or extra training or a post-university/professional education. It is possible to do a careers advice test. The test consists of a number of components and a discussion with the study/careers advisor. Besides on an individual basis, you can also participate in an introductory course studies/career choice. The careers advice test and the introductory course each cost 10,-. Information and registration at the Student Affairs Desk.

#### *Service centre Job market for Higher Educated*

The Service centre Job market Higher Educated is concerned with students who have almost completed their studies or who have just graduated. The activities of the Service centre prepare you early on for what you can expect following your study and they stimulate that your study link up well with the job market. The Service centre has information on employers and vacancies, on selection procedures and on recruitment and selection. You can visit the Service centre without an appointment on Monday, Tuesday and Thursday afternoons from 13:30h until 17:00h. The staff of the Service centre can be reached per telephone via tel. 024-3615804 or via e-mail address [loopbaan@dsz.ru.nl](mailto:loopbaan@dsz.ru.nl).

#### *Studying skills training courses*

The trainers of the Office of Student Affairs give courses and training in the sphere of studying skills, social skills and professional skills. Examples include a course in writing a thesis or a job interview training course, but also training in giving presentations or a self-management course. All of the courses are described briefly in the Vademecum. A survey of the dates upon which the courses have been planned is available at the Desk. Pre-notifications can often be found in VOX. Some courses require that you set up an appointment beforehand. You can register for a course at the Student Affairs Desk.

### **International Office**

The International Office department advises and supports the Board of Governors and the faculties where it concerns developing and maintaining the external relationships of the RU. Students can call upon the International Office department for questions concerning:

- studying abroad and the grants that are available to that end: see Studying abroad
- conducting research in connection with traineeship/thesis: see Research & Society
- keeping in contact with the university and fellow students *after graduation*: see Alumni *Studying abroad*

More and more students come to the conclusion that studying abroad for a while is very

worthwhile. This is not only true if you come across subjects during your studies that are not offered in the Netherlands. Studies have shown that a period of studying abroad can be very significant for one's personal development, studies and perspective.

The possibilities of studying abroad are almost unlimited. There are all kinds of national and international programmes that render a stay abroad possible and there are many types of grants and funds with which to finance a period of studying or a traineeship abroad.

More information? Visit our website [www.ru.nl/io/english](http://www.ru.nl/io/english) Of course, you can always call or drop by as well.

*Visiting address:* Comeniuslaan 4

Correspondence address: P.O. Box 9102, 6500 HC Nijmegen

T: 024 - 3616055

e-mail: [internationaloffice@io.ru.nl](mailto:internationaloffice@io.ru.nl)

Opening hours: on working days from 10.00h until 17.00h.

### *Research & Society*

The university maintains contacts with all kinds of social organisations and the (local) authorities in the Netherlands. These include, for example, knowledge centres for multicultural issues, Provincial States or environmental advisory bodies. These and other organisations regularly approach the university with social issues. Students can conduct scientific research for organisations of this kind as part of their final project. In addition, External Relations is always looking out for interesting social themes and research questions in this respect. This because the university finds it important to share the knowledge that is available at the university *and* to test this knowledge in actual practice.

### *Alumni*

Graduated? The university would very much like to keep in touch with you. There are different ways in which to achieve this. For example, you can become a member of the former students' association, make use of the network facilities and be allowed discount facilities. A good way to keep in contact with former fellow students, to make new contacts and to exchange experiences.

Visit our website if you want more information [www.ru.nl/io/english](http://www.ru.nl/io/english) under *International alumni*.

## **Study facilities**

### *The library*

The library of the Faculty of Science is located on the ground floor of the new building. The opening hours are Monday through Friday from 9.00h until 17.30h. The library is accessible to everyone. A lending pass is mandatory. Students can collect a lending pass free of charge at the lending counter of the Central University Library: Address: Erasmuslaan 36, Nijmegen. Internet: <http://www.ru.nl/ubn/>

Opening hours Monday through Thursday: from 8.30h until 22.00h (applications until 17.00h; lending department and information desk closed after 17.30h). Friday: from 8.30h until 20.00h (applications until 17.00h; lending department and information desk closed after 17.30h). Saturday: from 9.00h until 17.00h (lending books is possible: lending department is open; information desk is closed).

*Terminal rooms and STAP-work stations*

C&CZ manages a number of work stations for the Faculty of Science that, in principle, can be used by anyone with a login. The latest information is available on the following site:  
<http://www.cncz.science.ru.nl/ned/>

*UCI*

The University Centre of Information (UCI) offers a variety of computer facilities for students. There are computer courses that you can take at a reduced rate. Moreover, the centre sells inexpensive software packages and can provide documentation on various subjects in the sphere of computers. The UCI can also advise you when you purchase a computer. The latest information and the services offered by the UCI can be found on the UCI website.

*UCI*

Geert Grooteplein 41

Opening hours: Monday through Friday: 9.00h - 13.00h and 13.30h - 17.00h.

tel. 024 - 361 79 39

e-mail [info@uci.ru.nl](mailto:info@uci.ru.nl)

Internet: <http://www.uci.ru.nl>

*Emergency fund*

The Emergency fund can be of help to RU-students by means of providing an interest-free loan in the event of financially difficult situations. These are to be of an incidental nature: that is to say that the situation may not concern structural (permanent) problems with your (student) grants. You can request a loan directly at the Student Affairs Desk.

*Financial support in the event of a delay in your studies due to special circumstances*

If special circumstances cause a delay in your studies and, as a result, you face problems with your student grants, then you may qualify for financial support. These special circumstances are understood to mean, among other things, illness, special family circumstances, a functional disorder, the set-up of your studies or being involved in top-class sports. You are to report these circumstances at the Student Affairs Desk within three months. It is required in this respect that you consult with your educational advisor - in connection with the planning and, if required, supervision of your studies - *and* with a student counsellor. You are to state the agreements to that end on a report form that can be obtained at the Desk. After the academic year, you will receive a registration form with which to record the delay in your studies. You are to send it back together with the items of evidence and a statement from the educational advisor. Afterwards, you will receive an order from the Board of Governors that entitles you to a number of months of financing from the fund. You can request these funds as soon as you have spent all of your student grants and have yet to graduate. You will then receive a benefit from the graduation fund for this number of months. A application form to that end is available at the desk.

*Financial support in the event of a delay due to management activities*

RU-students who fulfil administrative positions in faculty boards, committees or student associations are entitled to a number of months of financial support from the Graduation fund. The purpose of this support is to enable the student to graduate if his/her studies have been delayed due to managerial activities. As of September 2002, this financial support is

paid out during the administrative year and is no longer dependent of whether or not there is actually a delay in one's studies. The regulation Financial Support Students is included in its entirety as an appendix to the student statute (included in the Vademecum). You can also call upon the student counsellor for information and advice.

### *Student Statute for RU-students*

General information on housing, living, welfare, student grants, studying, rights and obligations of students, services provided, associations and organisations for students you can find on [www.ru.nl/students](http://www.ru.nl/students). The regulation Financial Support Students (for example, in the event of a delay in your studies due to management activities) is included. What's more, it conveniently includes relevant addresses and telephone numbers.

The student statute is also mentioned on that site. It is made up of a description of the rights and obligations of all of the students who are registered at the RU that are the result of legal and university regulations.

## **Exams**

### *Master's examination*

In order to make an application for the master's examination, you are required to present the following documents at the Faculty Students Administration/Examination department (FSA) (room HG 00.134):

- Valid student card (student card and registration card)
- Bachelor's degree (original; only for students who completed their foundation course elsewhere)
- passport or ID or excerpt from the register of births, deaths and marriages or the municipal register or the register of births
- The approved combination of subjects must be present at the Examination department/ Students administration.

NOTE!: this combination must be handed in not later than 3 months prior to applying for the master's examination in connection with the assessment by the examining board.

- (If applicable:) an external candidate statement. It is to be handed in upon applying for the master's examination.

It is required that you were registered as a student or as an institute student (this is a student who is not entitled to student grants) during the academic year (or academic years) during which you participated in practical lessons. The same applies to thesis/traineeship supervision.

First you have to ask to apply for the master's examination at the faculty of Science. You should do that not later than 14 days *prior* to the date of the examination (this is the date upon which the exam is to be held). Upon applying, all of your marks must already be processed in ISIS/KISS. Other arrangements have been made for the final exam date of the year (namely 31-8-2010). You are to register for this exam not later than **May 31, 2011**. Some of your marks may not be known at that time. The last mark must be reported to the Students administration (during opening hours) not later than **August 31, 2011**.

After you have made your application for your master exam at the Faculty of Science you will get a letter with a declaration of the Committee of Exams that you apply for the certificate. With this letter you have to go to the the University Bureau of Exams at the Comeniuslaan 4 (Opening hours: 10.00h- 12.00h daily) to complete your application. They

check several things for example if you were subscribed as a student etc. Because of these checks the Bureau of Exams needs about 30 days to prepare your master certificate.

The master's examination is held 11 times per year. This is always on the last Tuesday of the month (with the exception of the month of Juli and if the last Tuesday is a day off, in which case the exam will be held one week earlier). The 'holding of the examination' is mainly an administrative affair: verifying that you have met all of the requirements and whether or not you took all of your subjects that are stated as the subjects that you have chosen.

The presentation of the master's degree takes place several times per year. The dates that correspond to the academic year of 2010-2011 are: **November 30, 2010, January 25, 2011, March 29, 2011, May 31, 2011, June 28, 2011, August 30, 2011 and October 18, 2011.**

During the Master you are to submit your subjects to the examining board of Environmental Sciences. This combination of subjects makes up the subjects and research traineeships that you intend to complete during the Master programme in order to meet the minimum requirements to graduate. You can request an application form at the educational secretariat. You are to submit your choice of subjects to this secretariat as well, addressed to the examining board of ES. You are also to include a brief explanation of the nature of your research traineeships. You can have this explanation approved beforehand by one of the contacts of the education programme by means of a signature.

The examining board assesses your combination of subjects in terms of gravity and content and also considers the coherence. So as not to be disappointed, it is therefore advisable that you timely request the approval of the subjects that you wish to choose. Your initial choice is not binding for the duration of your studies. If you prefer to choose some other subject(s) during your studies, then you simply need to present your new combination to the examining board. In order to graduate, you must comply with the requirements pertaining to your most recently approved combination of subjects.

### **Right of complaint**

It is laid down in the faculty regulations that you have the right as a student to file a complaint in writing, either individually or as a group, with the faculty administration. This refers to complaints that concern the manner in which the university observes its obligations towards students.

In the event that you disagree with the results of a preliminary exam, or if you feel you were treated unfairly, then you would do best to contact the university teacher concerned or the educational advisor. In addition, you can also call upon the examining board of your study programme. If there remains an insuperable difference of opinion, then your final option is to lodge an appeal against the decision concerned (an exam result) or the treatment concerned. The decision / treatment must be either in contravention of the Educational/Examination regulations, or in contravention of the principles of reasonableness and fairness. An appeal of this kind is to be filed in writing within 30 days after the decision has been made or the treatment took place. The student counsellors of the Office of Student Affairs can help you draw up a notice of appeal. In the event that the appeal is found to be admissible by the Board of Appeal for Examinations, then any possible solutions or a compromise will be considered. If such proves not to be possible, then the Board of Appeal, after hearing both parties, will ultimately come to a decision.

*Address:*

Board of Appeal for Examinations  
Comeniuslaan 4  
P.O. Box 9102  
6500 HC Nijmegen  
T:024-3615700

*Collective right of complaint*

The collective right of complaint concerns complaints that have to do with the manner in which the university observes its obligations towards students. Students can call upon the faculty student counsellor for complaints of this kind. The complaint is to be filed within 3 months following the facts concerned and is to be supported by at least five students. The student counsellor will form an opinion within one month, unless the decision-making process requires more time. In that case, he will inform the students concerned of when they can expect a decision.

**Quality Care**

The RU attaches great value to the quality of the education that it provides. Both the academic programmes as well as the students are expected to make various efforts in order to achieve the best possible result. Concerning the academic programmes, the quality care is both internal and external.

The internal quality care is aimed at the entire range of activities for the purpose of maintaining and improving the quality of the training within a faculty or academic programme.

All higher educational institutes are required to be officially recognised. The external quality care provides a final assessment to that end; a quality mark is ascribed to a training programme. This quality mark is a precondition for the funding of the programme, student grants and loans, the recognition of the diploma's and the granting of degrees. Training programmes are independently assessed and there is a strong emphasis on product quality (the level achieved by graduates) and on internal quality.

The faculty education committee, on behalf of the faculty administration, co-ordinates the process of quality control and quality improvement on the faculty level. The programme committee plays a key role in this respect on the level of the training programme. This committee examines whether the quality level of the organisation, co-ordination, execution and programming of the academic training and the counselling and tutoring is sufficient. The programme committee also considers any improvement measures that are to be taken. This committee provides solicited and unsolicited advice to the faculty administration, the training director, the co-ordinator and the module co-ordinators concerning the execution and the programming of the academic training. Students make up half of the programme committee, and so the students are very involved in the process of quality care.

An important tool with which to monitor the quality of the academic programmes concerns the surveys with respect to the courses and research traineeships and the verbal evaluations of the courses. The survey allows you to air your opinion of the training anonymously. Each course (or module) co-ordinator is required by the training committee to annually evaluate his/her module using standard questionnaires. The co-ordinator draws up a report on the findings (in accordance with a standard format) and also indicates the performance figures.



Options for improvements and when these are to be scheduled are to be stated for the bottlenecks that become evident. The research traineeships are evaluated using standard forms as well. The questionnaire concerning these traineeships is distributed by the supervisor on completing the traineeships, as soon as the report has been discussed. The training co-ordinator collects these completed questionnaires and draws up a report on the results. All of these reports are public and can be examined at the secretary of the programme committee. The programme committee discusses these reports, consults with the programme management or the teachers concerned if necessary and checks that the proposed plans for improvements are actually carried through.

## 2 The master programme

### 2.1 Main orientations

You can choose between the following main orientations (variants) during your master's programme:

- *The research orientation (R)* is intended for those who wish to conduct fundamental or application-oriented research at a university, company or research institute. There are two fields of research from which to choose.

For both research tracks you will acquire knowledge, insight and practical skills and you will master a scientific way of thinking. You will then be capable of generating solutions to problems in the sphere of environmental sciences in a manner that is inventive and scientific, as well as socially sound.

The first research track is **Human and Environmental Risk Assessment (HERA)** which addresses human health and environmental risks caused by various environmental stressors. HERA is a field of expertise that involves a variety of disciplines including (eco)toxicology, environmental chemistry, risk management and communication.

The track **Water and Nature Management (WNM)** focuses on fundamental and applied research in the field of ecological risk assessment, (water) ecosystem management and biological conservation, with special emphasis on riverine, coastal and marine environments. There are opportunities to perform both field and desk studies including multidisciplinary approaches involving e.g. ecology, hydrology, chemistry, environmental history and environmental law.

- *The management and Technology orientation (M&T)* will appeal to those who wish to fill a policy-related, management or commercial position with a scientific background. The MT-subjects provide insight into the managerial and administrative perspective on social and organisational problems and the concepts, models and instruments that are used by companies (profit and non-profit) and the authorities to tackle these problems in practice. You learn to consider your knowledge of the scientific backgrounds of current issues within the broader framework of the development of a company, the economy and society.
- *The communicative orientation (C)* trains students to fulfil academic positions in the sphere of the communication of science (research, application, media). If you graduate in this orientation, then you will be a  $\beta^+$  who has acquired supplementary theoretical insights and communicative skills that broaden your own field ( $\beta$ - $\gamma$ -integration). You will gain insight into the communication with respect to innovation processes and processes of change, as well as insight into the use of (mass) media and popularisation.
- *The educational orientation (E)* provides you with the starting competence to adequately carry out the key tasks of a teacher on the one hand and the capacity to develop yourself further as a fully qualified teacher on the other. Within the E-orientation, you will acquire competences in the sphere of six teacher roles, namely: the teacher in the classroom, the specialist in his/her field, the educationalist, the reflecting professional, the teacher

outside the classroom and finally the developer and researcher.

- *The specialisation Transnational ecosystem based Water Management (TWM)*. In this new programme, rivers are considered valuable natural systems. By means of a step-by-step plan (retain, store, drain), managers can determine what limits there are in the spatial planning of a river basin and where they are found. Flooding risks can be reduced by restoring river systems to their natural state. This new approach requires other management techniques and public involvement. Therefore, it is essential that future water managers gain a thorough understanding of sociology, law and management in addition to such obvious disciplines as ecology, hydrology and engineering. The two-year programme is a joint initiative of the university of Duisburg-Essen (Germany) and Radboud University Nijmegen (Netherlands). TWM students will graduate at both universities and TWM prepares students for an international career in water management. The master's programme of each orientation started 2010-2011 is summed up below:

Research orientation (general) and differentiation Water and Nature Management (WNM)

- Mandatory subjects environmental sciences (15 EC: Orientation, Ecological & Env. Concepts, Management of Ecosystems, Biodiversity & Ecological Assessment, Ecological & Env. Modelling).
- Philosophy (3 EC)
- Two environmental science research traineeships (minimum each of 36 EC)
- Thesis / Theoretical component (12 EC)
- Free space and optional courses (18 EC):
  - extension of a (external) environmental science research traineeship up to 45 EC
  - a (career-oriented) traineeship of 15 EC
  - other exam components

Research orientation differentiation Human and Environmental Risk Assessment (HERA)

- Mandatory subjects environmental sciences (21 EC: Orientation, Ecological & Env. Concepts, Occupational Toxicology, Ecological & Env. Modelling, Risk Management of Chemicals (3 ec) or Sustainable Production & Consumption (3 EC) , Risk Communication)
- Philosophy (3 EC)
- Two environmental science research traineeships (minimum each of 36 EC)
- Thesis / Theoretical component (12 EC)
- Free space and optional courses (12 EC):
  - extension of a (external) environmental science research traineeship up to 45 EC
  - a (career-oriented) traineeship
  - other exam components

M&T-orientation

- Mandatory subjects environmental sciences (15 EC: Orientation, Ecological & Env. Concepts, Management of Ecosystems, Biodiversity & Ecological Assessment, Ecological & Env. Modelling).
- Philosophy (3 EC)
- One environmental research traineeship (30 EC)
- Mandatory basic courses (5\*5=25 EC)
  - Business & Society
  - Organizations Science
  - Innovation Management
  - StrategyMarketing
  - Finance & Accounting
- M&T- optional course(s; 5 EC): Science & entrepreneurship (3 EC), Research Strategy & Management 3 EC), Industriële fijnchemie (Dutch; 3 EC), Algemene managementvaardigheden (Dutch: 2 EC) or an other course.
- Final project (27 EC)
- Free space (15 EC) (See R-orientation)

C-orientation

- Mandatory subjects Environmental Sciences (15 EC: Orientation, Ecological & Env. Concepts, Management of Ecosystems, Biodiversity & Ecological Assessment, Ecological & Env. Modelling).Philosophy (3 EC)
- One environmental research traineeship (30 EC)
- Mandatory basic courses (7\*3=21 EC)
  - Introduction Science Communication (3 EC)
  - Science and Societal Interaction 3 EC)
  - Risk Communication 3 EC)
  - Boundary Work 3 EC)
  - Framing Knowledge 3 EC)
  - Knowledge Society 3 EC)
  - Science, Media and Strategy 3 EC)
- Optional courses of 6 EC
- Final project (30 EC); in the area between (Nature)Science and Community
- Free space (15 EC) (See R-orientation)

E-orientation (E-variant; most components are lectured in Dutch)

- Verplichte vakken (15 EC: Orientation, Ecological & Env. Concepts, Management of Ecosystems, Biodiversity & Ecological Assessment, Ecological & Env. Modelling).
- Filosofie (3 EC)
- Een milieuwetenschappelijk onderzoeksstage (30 EC)

- Begeleide stage en betaalde stage (samen 57 EC. Deze stages zijn integrale leertrajecten, waarin een continue wisselwerking van theorie, praktijk, intervisie en supervisie plaatsvindt).
  - Vrije ruimte (15 EC) (Voor invulling: zie O-variant / R-orientation)
- TWM-specialisation

- Mandatory subjects (57 EC; Orientation, Ecological & Env. Concepts, Management of Ecosystems, Biodiversity & Ecological Assessment, Ecological & Env. Modelling, Integrated Water Management, Social aspects of Water Management, Environmental Economics, Water Gov. & Spatial Planning and the courses lectured in Germany (see 4.3)
- Philosophy (3 EC)
- Free space (14 EC)
- Project (16 EC)
- Master thesis (30 EC)

More information on the contents of the courses of the M&T orientation are available on the website: <http://www.studiegids.science.ru.nl/2010/mt> and the same applies for the C-orientation on the website: <http://www.studiegids.science.ru.nl/2010/communicatie>.

Information about the schedules of the courses you can find on the website of BioSciences: <http://www.biowetenschappen.science.ru.nl/>

It is possible that there are some last-minute changes, for instance in the lecture-rooms.

Usually these changes are passed on via Blackboard, or e-mailed to you on your @student.science.ru.nl address. Therefore regularly check your email!

## 2.2 Traineeship Environmental Sciences in general

The master programme starts with several courses. Upon completing these, you will proceed to conduct research in environmental sciences.

Most of the research traineeships take place at the departments of the Faculty of Science or the Faculty of Medical Science. It is also possible to do a research traineeship elsewhere.

External traineeships often concern research institutions, organisations or companies (for example, RIVM, Alterra, consultancies, KEMA, ANDENO) with which the departments of the Faculty of Science maintain contacts.

In addition to a daily supervisor during the external traineeship, the student will also be appointed a supervisor at the faculty for the purpose of monitoring the progress and quality of the research traineeship. External traineeships often go hand in hand with separate traineeship agreements in which certain arrangements are made concerning supervision, responsibilities, products and traineeship allowances.

If you find it difficult to choose, then you can opt to set up an appointment with the educational advisor in order to discuss matters. You can also call upon the contact persons of the various departments for additional information concerning the research traineeships that they offer. It is important that you realise that the subjects mentioned are not exhaustive. It is often possible to propose a subject of your own, provided that it is in line with the research that is conducted at the department concerned.

The majority of the departments requires that you apply for a research traineeship at least 1 month before and no earlier than six months before the start of the traineeship. You can

register for a traineeship at the secretariat of the department concerned or through one of the permanent staff members of the department.

## 2.3 Free space

The scope of the free space in the master's programme varies per orientation. You can work out the details of your free space at your own discretion, provided that the examining board approves the components of your choice. It is required that the components of the free space are of a master level.

You have the following options when determining your free space:

- Extending your traineeship with 9 ec (e.g. from 36 to 45 credits).
- Increasing the number of environmental or environment specialistic modules (for example with modules that are part of Biology, Biomedical Sciences, Environment-Social Sciences or Law).
- Occupation-oriented traineeship
- Other courses (meaning not environmental or environment specialistic), provided that it is of a master level.

Concrete examples of the courses in environmental sciences that can be followed as part of your free space include all of the courses listed below.

The occupation-oriented traineeship (15 credits) may also concern part of your master's programme. You can do your occupation-oriented traineeship at a government authority or a social organisation, such as the Ministry of Housing, Spatial Planning and the Environment, the Ministry of Transport, Public Works and Water Management, a municipal authority or an environmental pressure group such as 'Milieudedefensie'. The focus of this traineeship concerns the exploration of the field of action during which you become familiar with the structure and method of working.

The Master programme offers the opportunity to take many courses. These courses may be part of the curriculum of other related disciplines and/or parts of other programmes of an environment-scientific nature. If desired, you can also take courses at the University of Wageningen (WUR) or the Open University (OUNL). In addition, you may take courses that make up part of one of the other orientations. Some courses may make up part of various orientations. Other courses are lectured only once in two years. You are to work out the scheduling of these optional courses on your own. Some courses are only lectured in Dutch. For capita Biology see the website of the master Biology and Medical Biology. Below you will find an example of the possibilities:

### *Research orientation*

- Estuariene Oecologie (3 EC; Biology, FNWI)
- Milieuperceptie en gezondheid (6 EC; FMW; zie ook site of CSMR)
- Capita Biologie (3 EC; Biology, FNWI)
- Ecology and management of large rivers (3 EC; Biology, FNWI)
- Adaptatiefysiologie (6 EC; Biology, FNWI)
- (Arbeids)milieu en gezondheid: de rol van perceptie en communicatie (6 EC; CSMR)

- Gender Aspects of Integrated Water and Natural Resources Management (3 EC; CSMR)
- Arbeidstoxicologie en milieuzorg (6 EC; FMW)
- Chemische mutagenese en carcinogenese (6 EC; FMW)
- Reproductietoxicologie en epidemiologie (6 EC; FMW)
- Milieuchemie (code N28212; OUNL); <http://www.ou.nl/>
- Organismen in hun omgeving (code N42112; OUNL); <http://www.ou.nl/>
- Occupational Toxicology (6 EC, FMW)
- Research Skills (3 ec; FNWI)

*Differentiation: Human and Environmental Risk Assessment*

- Chemical mutagenesis and carcinogenesis (5,7 ec; MF:5T003)
- Integrated Environmental Assessment of Water Systems (5 ec; FNWI: MM003C)
- Accidents and disasters involving hazardous substances (5,7 ec; MF: 5MG02)
- Statistical software (5,7; MF: 5E002)
- Analysis of small scale experiments (5,7 ec; MF:5AM07)
- Animal testing and alternatives (5,7; MF:5 AM01)

*Management and Technology orientation*

- Ecology and management of large rivers (3 EC; Biology, FNWI)
  - Science & entrepreneurship (3 EC) zie <http://www.studiegids.science.ru.nl/2010/mt>
  - Research Strategy & Management (3 EC) zie <http://www.studiegids.science.ru.nl/2010/mt>
  - Industriële fijnchemie (3 EC) zie <http://www.studiegids.science.ru.nl/2010/mt>
  - Algemene managementvaardigheden (3 EC) zie <http://www.studiegids.science.ru.nl/2010/mt>
  - Gender Aspects of Integrated Water and Natural Resources Management (3 EC; CSMR)
  - Milieu en samenleving (4 EC; NSM)
  - Gezondheidsbewaking (6 EC; FMW)
  - Arbeidstoxicologie en milieuzorg (6 EC; FMW)
  - Risico-evaluatie van milieufactoren (6 EC; FMW)
  - (Arbeids)milieu en gezondheid: de rol van perceptie en communicatie (6 EC; CSMR)
  - Interfacultaire cursus milieu, vrede en duurzame ontwikkeling (6 EC; CSMR)
  - Milieuchemie (code N28212; OUNL); <http://www.ou.nl/>
  - Organismen in hun omgeving (code N42112; OUNL); <http://www.ou.nl/>
- Communication orientation, Education orientation and TWM-specialisation*

- Wetenschap en Literatuur (3 EC; FNWI)
- Ecology and management of large rivers (3 EC, Biology, FNWI)
- Milieu en actor (6 EC; NSM)
- Interfacultaire cursus milieu, vrede en duurzame ontwikkeling (6 EC, see site of CSMR)
- Gender Aspects of Integrated Water and Natural Resources Management (3 EC; CSMR)
- Milieu en ontwikkeling (4 EC; NSM)
- Milieu en samenleving (6 EC; NSM)
- Milieuchemie (code N28212; OUNL); <http://www.ou.nl/>

- Organismen in hun omgeving (code N42112; OUNL); <http://www.ou.nl/>

## **2.4 Philosophy**

The course in Philosophy is a mandatory component for all students of the RU and has been included in the programme because of the necessary insight that one must have in the (environmental) field of study and the degree of reflection that is required.

The philosophy course of your master's programme corresponds to 3 credits. Three courses of philosophy are described below. We refer you to the website for a more comprehensive description of other courses in philosophy: <http://www.ru.nl/fil-beta>



## Environmental Ethics

Course ID: **FFIL209B** 3 ec

dr. M.A.M. Drenthen  
S.A.J. Segers

### Teaching methods

- 24 hrs lecture
- 2 hrs personal study counseling
- 54 hrs individual study period

### Prerequisites

Students are expected to have completed the bachelor course 'Inleiding in de Filosofie en Ethiek'

### Objectives

After completing this course,

- the student is familiar with the major topics, approaches and concepts in environmental ethics and landscape philosophy
- the student can distinguish scientific reasoning from other forms of intellectual activity
- the student can take a substantiated position in ethical debates on issues of landscape and ecosystem management.
- the student can read, analyze and critically assess philosophical texts, and to apply them to actual cases
- the student can publicly present and discuss a philosophical text

### Contents

This course will discuss major topics in environmental ethics and landscape philosophy:

- Basic attitudes toward and images of nature, anthropocentrism vs. ecocentrism,
- Should we recognize the 'intrinsic value of nature'?
- Subjective and objective value in environmental ethics. Does the value of nature depend on our taste?
- The ethics of large herbivores in the Oostvaardersplassen. How to solve the conflict between animal ethics and ecological ethics.
- Aesthetic reasons for environmental protection: does nature's beauty matter?
- Nature development, biodiversity and the concept of wildness - Why do we want nature to be wild?
- Bioregionalisme en the Ethics of Place- Which places matter to us and why?

### Literature

texts will be provided via Blackboard

### **Examination**

Attendance is mandatory. Grades will be based on group presentation, written assignments and participation in class discussions. There will be no final exam.

**Students have to apply for this course via Blackboard, at least 4 weeks before the start of the course. Maximum number of applicants: 20.**

This course will be taught in Dutch. Foreign students who are interested in this topic, are advised to sign up for the course 'Philosophy of watermanagement' (FFIL212).

### **Extra information**

**Seminars will be twice a week: on Monday 13.45-15.30 and Thursday 13.45-15.30.**

**Attendance is mandatory!**

The first meeting will be on Monday 15 November 2010; the final meeting Thursday 6 January 2011.

**(CHECK THE OFFICIAL 'ROOSTER' SITE (<http://rooster.ru.nl>) FOR THE MOST RECENT TIMES AND PLACES)**

This course can be substituted by other advanced philosophy courses (see the courses on offer from the philosophy department)

This course will be taught in Dutch. Foreign students who are interested in this topic, are advised to sign up for the course 'Philosophy of watermanagement' (FFIL212), that deals with similar questions.

## Global Ethics and Sustainable Development

Course ID: **FFIL210A** 3 ec

third quarter

prof. dr. F.W.J. Keulartz  
drs. I.E.M. Dankelman  
S.A.J. Segers

### Teaching methods

- 20 hrs lecture
- 2 hrs personal study counseling
- 60 hrs individual study period

### Objectives

Students should gain some basic insights in globalization processes and their ecological, economic and social impact. They should be able to indicate and discuss issues of global ethics such as climate change, poverty elevation, and sustainability.

### Contents

In this course, the contribution of the newly emerged discipline of global ethics to a fair and equitable approach to global challenges will be examined. Three topics will be discussed: (1) climate change; (2) poverty and development; and (3) sustainable development.

### Literature

Will be distributed.

### Examination

Students should study the literature, participate in discussions, make at least one presentation, and write a brief essay.

### Extra information

Foreign students should contact the teacher 6 weeks in advance.

## Philosophy of Watermanagement

Course ID: **FFIL212** 3 ec jan (2 weeks)

dr. M.A.M. Drenthen  
prof. dr. H.A.E. Zwart  
prof. dr. F.W.J. Keulartz  
S.A.J. Segers

### Teaching methods

- 10 hrs excursion
- 64 hrs lecture
- 8 hrs individual study period

### Prerequisites

Students are expected to have completed the Bachelor philosophy course 'Inleiding in de filosofie en ethiek' or a similar introduction in philosophy

### Objectives

After completing this course,

- the student is familiar with the major topics, approaches and concepts in environmental ethics and landscape philosophy
- the student can distinguish scientific reasoning from other forms of intellectual activity
- the student can take a substantiated position in ethical debates on issues of landscape and ecosystem management.
- the student can read, analyze and critically assess philosophical texts, and to apply them to actual cases
- the student can publicly present and discuss philosophical texts

### Contents

In this course, we will deal with some philosophical aspects regarding water management.

We will discuss the major topics from environmental ethics and landscape philosophy:

- The relation between environmental science and environmental ethics
- Basic attitudes toward and images of nature, anthropocentrism vs. ecocentrism
- Intrinsic value of nature: subjective? objective?
- Ecological restoration or faking nature?
- Conflict between animal ethics and ecological ethics
- Aesthetics and environmental protection
- The concept of wilderness
- Bioregionalism and Ethics of Place

There will also be a day-long excursion to a 'new' nature reserve.

### Literature

Texts and assignments will be made available in Blackboard.

### Examination

Grades will be based on written assignments, on oral presentations and on participation in group presentations and class discussions. There will be no final exam.

**Extra information**

This course will be int to weeks on a full time basis. Attendance is mandatory.

week 3: Monday 17 January - Friday 21 January 2011; week 4: Monday 24 January - Friday 28 January 2011.

**(CHECK <http://rooster.ru.nl/> FOR MOST RECENT TIMES AND PLACES)**

**Students who wish to follow this course have to SIGN UP AT LEAST 4 WEEKS BEFORE THE START OF THE COURSE. Please conform your subscription in Blackboard by pressing the 'group activation' button.**

**Maximum number of applicants: 20.** TWM-students will have prior access; foreign language students have prior access over Dutch-speaking students.

Nederlandstalige niet-TWM studenten worden geadviseerd om te overwegen in plaats van deze cursus het vak Environmental Ethics (FFIL209B) te volgen.

### **3 Description of Courses Environmental Sciences**

## Orientation in biology and environmental sciences

Course ID: **BM036A** 3 ec August 30 - September 10, 2010 prof. dr. J.C.J.M. de Kroon  
prof. dr. ir. A.J. Hendriks

### Teaching methods

- 15 hrs excursion
- 18 hrs lecture
- 4 hrs question session
- 18 hrs problem session
- 20 hrs individual study period

### Contents

As a first Master course in the curriculum you will become acquainted with the research as carried in the Institute for Water and Wetland Research (IWWR), where most general biologists from Nijmegen reside. After a general introduction to the mission and research program of the IWWR, you will receive information from all IWWR research groups on the topics they study and the methods and instruments they use. This program is supplemented with excursions to institutes and organisations for you to get clear impressions of the working environments of Nijmegen biologists, the kind of problems they tackle, and how the knowledge you acquire is applied. Finally, this Orientation course contains a self-assessment on your personal goals for your Master program and the working environments that you prefer, so that you can make well-founded choice for the tracks and interships to choose.

### Examination

- attend a minimal number of research group introductions and excursions
- fill in the self-assessment

## **Ecological and environmental concepts**

Course ID: **BM038A** 3 ec September 13 - 24, 2010

dr. H.J.R. Lenders  
prof. dr. ir. A.J. Hendriks  
dr. R.S.E.W. Leuven

### **Teaching methods**

Lectures, self study and discussion sessions

### **Objectives**

The student is acquainted with the concept of sustainable development and can handle derived concepts and methods for environmental and ecological research and management.

### **Contents**

In this 3EC course ecological and environmental concepts will be presented and discussed. Starting point will be the concept of Sustainable Development in its broadest sense (ecology/environment, economy and social aspects, otherwise known as the triple P concept: People, Planet and Profit). Emphasis will be on the historical context and on (handling) the unknown future of sustainable development. Subjects that will be passed in review are: Reference and Target Images, Ecology & Economy, Ecosystem Health, Novel Ecosystems, Cradle to Cradle, Scenario Analysis, and Multiple Criteria Analysis. Presently, further details cannot be given since the course is still under construction yet.

### **Subjects**

See course description. Details will be announced later.

### **Literature**

To be announced later

### **Examination**

Written examination

### **Extra information**

The course is still under construction



## Management of ecosystems

Course ID: **BM039A** 3 ec September 27 - October 8, 2010

prof. dr. J.G.M. Roelofs  
dr. L.P.M. Lamers

### Contents

Nature management and restoration has, to a large extent, been based on a trial and error approach. In the present course we will show, for a large variety of ecosystem types, why an approach based on biogeochemical research is vital for ecosystem management and restoration. This method, focusing on key factors and key processes, provides insight into the actual causal relationships between environmental changes and ecosystem responses. In addition, it indicates the target processes for restoration and conservation of biodiversity, and thereby enables scientists and nature managers to predict restoration prospects for locations that differ with respect to their initial conditions.

## **Biodiversity and ecological assessment**

Course ID: **BM040A** 3 ec

October 11 - 22, 2010

dr. R.S.E.W. Leuven

### **Teaching methods**

Lectures (11 h), Tutorials (2 h), working group assignments (5 h), practical training (5 h), Project: writing review (28 h), presentations(2 h), self tuition (24 h), written exam (3 h)

### **Prerequisites**

BSc Environmental sciences, Biology, Natural Sciences.

### **Objectives**

The course is focused on competences, skills and knowledge that will be required for research on biological diversity and assessments of biodiversity in (aquatic) ecosystems.

### **Contents**

The course gives an overview of contemporary scientific concepts and theoretical backgrounds concerning biological diversity. Subsequently, the focus will be on the relevance of biodiversity for functioning of (semi) aquatic ecosystems and the assessment of biodiversity values in riverine systems. The course will be concluded with current themes in biodiversity research.

### **Subjects**

The first part of the course deals with concepts and theory on biological diversity. The focus will be on key questions, such as: What is biodiversity? How to measure and to value biodiversity at various spatial and temporal scales? and What are key factors determining biological diversity?. In addition attention will be paid to extinction of species (the concept of critical population size; irreplaceability of species, global biodiversity and indicators of recent decline) and conservation of biodiversity (legal protection of biodiversity and restoration measures for biodiversity). The second part deals with the relevance of biodiversity for functioning of (semi) aquatic ecosystems. This issue will be elaborated for various types of (semi) aquatic ecosystems such as mangroves, coral reefs, seagrass dominated ecosystems, wet grasslands and riverine ecosystems.

Biodiversity assessment and valuation will be elaborated for a case study on biodiversity in riverine ecosystems (e.g. application of BIO-SAFE model and ecological status assessments). The course will be concluded with reviews of current research themes such as biodiversity in relation to ecosystem services, ecosystem engineers, novel ecosystems, economical values, agricultural practice, aquaculture; appropriate assessments and bioinvasions.

### **Literature**

Student manual and literature will be available on Blackboard

## Environmental & Ecological Modelling

Course ID: **MM002A** 3 ec 25-10-2010 t/m 5-11-2010

prof. dr. ir. A.J. Hendriks  
 prof. dr. J.C.J.M. de Kroon  
 dr. A.M.J. Ragas

### Teaching methods

- 52 hrs computer course
- 16 hrs lecture
- 16 hrs individual study period

### Prerequisites

BSc Environmental Science(s), Biology, Chemistry, Molecular Sciences or Natural Sciences. The course is part of the MSc Biology and MSc Environmental Sciences.

### Objectives

After completing the course the student should be able to

- Indicate why and where models are needed in research and management on environmental, nature and water issues.
- Classify and evaluate environmental and ecological models (analytical, numerical, stochastic, deterministic etc.)
- Identify and follow the stages in model development in a structured approach (from derivation to validation)
- Understand and apply a few elementary models that are often used in ecological and environmental issues (e.g. exponential, logistic, hyperbolic equations)
- Build and apply simple models critically in the context of his/her own research or management activities in internships and jobs

### Contents

If we prepare an outdoor trip, we check the weather forecast, as projected by meteorological models. Political parties submit their programs for calculation of the expected economic benefits. Mathematical models have become indispensable in various parts of society, including ecological and environmental issues. Conclusions by scientists, recommendations by consultants and decisions by managers are often based on models.

Models allows one to

- connect causes to effects in long term, large scale and inherently complex issues, such as climate change or population development
- understand related phenomena in different fields, e.g. Michaelis-Menton kinetics of enzymes and Holling type II responses of predators
- combine confusing, contradicting or incomplete information, as obtained in the lab and field.
- circumvent practical, financial, ethical restrictions imposed by experiments and surveys
- provide quantitative predictions, including uncertainties, in addition to qualitative descriptions and explanations

- allow extrapolation knowledge outside the domain
- select models based on theoretical concepts for empirical curve fitting

The course starts with an introduction in modelling, discussing objectives, types and stages of models. Next, you will be made familiar with a few equations often used in ecological and environmental issues, by lectures and exercise demonstrating their behaviour. Next you will be trained in developing your own models, going through different stages, such translation of systems to models, calibrating parameters and a sensitivity analysis. You will become acquainted with different models used in different setting (research, management, consultancy) and different disciplines (ecology, chemistry, hydrology). The course ends with an exam testing all knowledge and skills acquired.

### **Literature**

Study material will be made available via Blackboard

### **Examination**

Combination of written exam and project.

## Occupational Toxicology

Course ID: **5T004** *6 ec*

04-10 t/m 29-10-2010

P Scheepers

### Prerequisites

The course is obligatory for students of the MSc Environmental Sciences which follow the research track Human and Environmental Risk Assessment (HERA).

### Objectives

- In a series of self study assignments the following subjects will be covered: risk assessment, ambient exposure assessment, biological monitoring, polymorphisms in biotransformation, material safety data sheets, occupational disease, personal protective equipment, occupational exposure limits and skin absorption.
- Students will learn how to use knowledge of the chemical structure to predict toxicity characteristics also using Structure Activity Relationships laid down in rule-based decision support systems.
- Students will work in groups to derive an occupational exposure limit for a toxic substance human and experimental animal data.
- Students will learn to work with a computer system (PIMEX) that combines continuous exposure data with a video image. This application can be used to analyze exposure determinants and explore possibilities for interventions to reduce exposure.
- During a computer training students will obtain skills in modeling of skin absorption of chemicals (SkinperX) and a decision support system will be used to increase understanding of determinants of exposure and to model interventions to reduce exposure (EASE).

### Contents

Workers in direct contact with industrial chemicals may suffer health consequences. These may be acute effects of an exposure to concentration peaks or health implications of low exposure levels that appear only after a very long exposure period such as cancer. In this course students will acquire research skills to identify possible occupational hazards, based on available material safety data sheets. The information of industrial products will be analyzed using toxicological databases on the Internet. As part of a risk assessment the students will learn how to obtain quantitative data on external and internal exposure during a survey in an industrial setting. Some toxic substances will be measured in air and (if possible) in biological samples. Exposure will also be modelled using computer applications. Attention will be given to strategies to reduce exposure to industrial chemicals such as substitution of chemical products, changes of process conditions, local exhaust ventilation and use of personal protective equipment.

### Subjects

biological monitoring, exposure assessment, material safety data sheets, and occupational diseases, risk assessment.

### **Literature**

C.D. Klaassen and J.B. Watkins, eds. (2003) Casarett & Doull's Essentials of Toxicology. McGraw-Hill, New York.

Gardiner K and Harrington JM (2005) Occupational Hygiene. Third Edition, Blackwell Publishing, Oxford, UK, 510 pp.

### **Extra information**

This course is obligatory for students of the differentiation Human and Environmental Risk Assessment (HERA)

If possible and excursion will be organized to an industry to discuss their views on risk assessment of toxic substances used and show some of the working conditions related to handling of industrial chemicals.

## Sustainable production and consumption

Course ID: **MM020** 3 ec

8-11-2010 till 19-11-2010

dr. M.A.J. Huijbregts  
ir. R. van Zelm

### Teaching methods

- 20 hrs computer course
- 6 hrs lecture
- 6 hrs question session
- 24 hrs individual study period

### Prerequisites

Learning objectives

The learning objectives represent the endpoints for the course and are formulated as main competences, sub-competences and essential notions:

Main competences

1. The student understands the concepts and methods that are used to assess the sustainability of production and consumption patterns in our society.
2. The student is able to select and interpret relevant data from scientific research and to use these data to quantify the environmental pressure of human activities.

Sub-competences

1. The student has insight in the structure of sustainable consumption and production methods
2. The student is able to interpret the results of life cycle impact methods
3. The student is able to apply and analyse models to perform an ecological footprint analysis
4. The student is able to apply and analyse models to calculate characterisation factors for human toxicity.
5. The student is able to apply and analyse models to calculate characterisation factors for acidification.
6. The student is able to identify, quantify, and analyse uncertainties in life cycle impact assessment models.

Essential notions

1. The student understands the scientific principles underlying life cycle concepts.
2. The student is able to identify strong and weak points of life cycle concepts.
3. The student has insight in the modelling of environmental dispersion of substances and their effects on humans and ecosystems.
4. The student has insight in the contributions of scientific research, methods and techniques to the establishment of sustainable production and consumption.
5. The student is aware of the uncertainties in current sustainable production and consumption methods

### Contents

Sustainable production and consumption is the use of goods and services, while minimizing the use of natural resources, toxic materials and emissions of waste and pollutants over the life cycle. The challenge is to improve the overall environmental performance of products throughout their life-cycle, to boost the demand for better products and production

technologies and to help consumers in making informed choices. All products cause environmental degradation in some way, whether from their manufacturing, use or disposal. The life-cycle of a product covers all the areas from the extraction of natural resources, through their design, manufacture, assembly, marketing, distribution, sale and use to their eventual disposal as waste.

The environmental assessment of production and consumption of products and services can be done in various ways. This course will give an overview and quantitative insights in the concepts and methods that are used to assess the sustainability of production and consumption patterns in our society.

## **Subjects**

Life cycle concepts to assess sustainable production and consumption

- Life cycle thinking, three pillars of sustainability, producer or consumer responsibility, input-output analysis, process-based LCA

Life cycle impact assessment

- Methods to address environmental impacts of products/technologies/etc., i.e. energy/exergy analysis, footprinting (ecological, carbon, water), Ecological Footprint
- Concepts and application of ecological footprinting

Acidification and eutrophication

- State-of-the-art inclusion of acidification and eutrophication in LCIA, i.e. generic and site-specific methods, critical load approaches and endpoint assessments.

Human toxicity

- Overview of the methods to include toxic impacts on humans in life cycle impact assessment, i.e. linear and non-linear approaches and the underlying assumptions behind the models employed.

Uncertainty

- Framework to address uncertainty (parameter, model, and scenario) and variability in LCA. Monte Carlo analysis to quantify uncertainty for a simple LCA system.

## **Literature**

Manual and Reader to be downloaded from Blackboard

## **Examination**

The course is concluded with a written exam, which will be graded with a mark. The exam is a so-called 'open-book' exam: during the examination it is allowed to consult all the learning materials. A calculator is required during the examination. All course components and learning materials are part of the examination material, thus including the student manual, reader, self-tuition assignments, working group assignments, (guest) lectures and tutorials. The exam focuses on insight obtained in the subject matter and appliance of knowledge and skills. It is tested whether the student achieved the learning objectives of the different course components. A mark of at least 5.5 is required to pass the written exam.



## Risk Communication

Course ID: **FC003B** 3 ec

second quarter

dr. R.P. Verhoeff  
dr. J.G. van den Born  
S.A.J. Segers

### Website

[www.ru.nl/sciencecommunication/](http://www.ru.nl/sciencecommunication/)

### Teaching methods

- 1 hrs personal study counseling
- 20 hrs problem session

### Prerequisites

The course builds on the introductory course on Science Communication from the Mastertrack Science Communication, and is part of the obligatory part of the Mastertrack. In addition, the course is open as an optional course for all MSc. Students.

### Objectives

- Students are familiarised with the place of risk in society, its characterisation, and the implications for communication
- Students are familiarised with actual cases and practices in Risk and Uncertainty Communication
- Students are familiarised with determinants of public perception of Risk and Uncertainty
- Students are familiarised with the role of the different actors and stakes in Risk Communication (for instance companies, government, local population) and how to position themselves among these actors

### Contents

Present day society has been characterised as a Risk Society. In the last decade, the risk society has been hugely influential, serving as a stimulus for academic, environmental and political dialogue. The communication of risk and the public understanding of risk have become important issues in Science Communication. This course aims to prepare students to actively engage in risk communication and to analyse, reflect on and assess risk communication practices (e.g. HPV-vaccination, the Mexican flu, global climate change). The course combines a practical and theoretical component. Discussions among students, teachers and guest speakers are matched with analyses of current scientific insights on issues of risk communication, risk perception and uncertainty.

### Literature

Literature will be made available on Blackboard

### Examination

assignment

**Extra information**

Thursday 15.30-17.30

Foreign students should contact the teacher 6 weeks in advance.

## Risk Management of Chemicals

Course ID: **MM014** 3 *ec*

dr. A. Hollander  
dr. M.A.J. Huijbregts

### Teaching methods

- 4 hrs computer course
- 4 hrs excursion
- 9 hrs lecture
- 109 hrs student project

### Prerequisites

For all students, except the Faculty of Medicine, the Bachelor course Human and Ecological Risk Assessment is recommended for gaining basic theoretical understanding of the risk assessment process. In case of indistinctness, the course coordinator takes the final decision on entry allowance.

### Objectives

The student is able to produce a risk assessment report on human and environmental risks of a specific chemical and to communicate the results and conclusion of the analysis to various stake holders in a realistic setting.

### Contents

The MSc course on Risk Management of Chemicals follows a project-oriented setting by evaluating the human and environmental risk of a chemical in a real-case setting, involving the company that produces the chemical under evaluation and the consultancy Haskoning with expertise on the evaluation of chemicals in daily practice. The course also familiarizes students with the institutions, policy and regulation involved.

In the first part of the course, important European legislation of chemicals with an emphasis on the Registration and Evaluation of CHEMicals (REACH) will be discussed, including an overview of tools, implementation projects and risk management measures to assess and reduce chemical exposure. The main part of the course is devoted to assess and communicate the human and environmental risks of a specific chemical in a realistic project setting.

### Literature

The following study material will be provided:

- a student manual with general course information (downloadable via Blackboard);
- a reader with (additional) theoretical background documents (downloadable via Blackboard);

### Examination

Evaluation of written project results and communication to stakeholders

### Extra information

The co-ordinator of the course is dr. A. Hollander (e-mail: [a.hollander@science.ru.nl](mailto:a.hollander@science.ru.nl)).

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This course will not be lectured in 2010-2011.

## Research Skills

Course ID: **MM013** 3 *ec*

second quarter

dr. R.S.E.W. Leuven  
dr. H.J.R. Lenders  
prof. dr. ir. A.J. Hendriks  
dr. A.M.J. Ragas

### Teaching methods

- 2 hrs lecture
- 1 hrs student presentation
- 45 hrs student project
- 2 hrs question session
- 30 hrs individual study period

### Prerequisites

BSc Environmental sciences, Biology, Chemistry or Natural Sciences.

This course is obligatory for all students environmental sciences of the Research orientation.

### Objectives

- Able to search, to manage and to refer consistently scientific literature references.
- Able to describe the "standard" contents of a research article and to apply this knowledge to increase the quality of papers.
- Able to discuss relevance of various interview techniques for different types of information and to prepare a formal interview.
- Capable of drawing up a research design (including a realistic time schedule) for a master thesis and expressing clearly and understandably how the research project is set up.

### Contents

The course is focused on competences, skills and knowledge that will be required for drawing up a feasible design of a master research project in environmental science and for preparation of master thesis or scientific publication about the results of that project.

### Literature

Student manual and reader will be available on Blackboard

### Examination

Beoordeling van projectverslagen

## Final Assignment

Course ID: **MM009** *4 ec*      01-09-2010 t/m 31-8-2011      prof. dr. ir. A.J. Hendriks

### Teaching methods

- 6 hrs lecture
- 100 hrs individual study period

### Objectives

After the final assignment the student will be able to write a research proposal that is in line with his or her future career plans.

### Contents

The final assignments is an individual assignment with the aim to prepare the student for the job market. The assignment is not fixed, but depends on the career perspective of the student. Example options for the final assignment are:

- Preparation of an academic research proposal (e.g., for NWO);
- Development of a commercial research offer (e.g., for a consultancy firm);
- Preparation of a research application (e.g., for a local government).

### Literature

Not applicable.

### Examination

The final assignment will result in a report (i.e., research proposal, offer or application) which will be graded.

## Intervision and professional communication

Course ID: **MM016** 3 ec

fourth quarter

dr. A.M.J. Ragas  
drs. C.L. Buise

### Teaching methods

- 3 hrs lecture
- 53 hrs problem session
- 2 hrs individual study period

### Prerequisites

This course is obligatory for all students Environmental Sciences of the Research orientation (including WNM and HERA).

### Objectives

After this course you will be able to make a better and motivated choice for your professional career based on your personal interests and qualities, as well you will learn communication skills required in a professional organization. In other words: you will be a more complete professional!

### Contents

The course is intended for all students that are in their last year of the MSc Environmental Science. The aim of the course is to provide you with communication insights and skills that will help you to function optimally in a professional environment, e.g. a research institute, consultancy or company.

The course coordinator is Carlo Buise who is a senior manager of the Occupational Health and Environmental Service at the Radboud University. He has extensive experience in management processes and personal efficiency training.

### Subjects

- Elementary communication skills
- Intervision
- Problem identification and solution
- Giving presentations
- Logical levels
- Reflection on your own skills

### Literature

Student manual and reader available in Blackboard.

### Extra information

The course has a maximum of 12 participants. Participants should be involved in an internship at the Department of Environmental Science or another internship organization. Students are admitted on a "first come, first served" basis.

## Integrated Water Management

Course ID: **MM019A** 3 ec 8-11 till 19-11-2010

prof. dr. A.J.M. Smits  
dr. S.V. Meijerink  
dr. M.A. Wiering  
prof. dr. P. Leroy

### Teaching methods

- 80 hrs groepsgewijs college
- 32 hrs individual study period

### Prerequisites

The course is obligatory for students of the MSc Environmental Sciences (including the tracks TWM and HERA) and open to students of other programmes. In case of indistinctness, the examination committee takes the final decision on entry allowance.

### Objectives

There are a number of learning targets; the student...

- Can formulate what political and legal factors basin managers need to understand and take into account when establishing basin management systems (Establishing basin management systems).
- Can give a description of the functions and the different kinds of Institutional and legal arrangements for basin organizations (Roles & types of river basins organizations).
- Can describe through which ways the basin organizations and basin Management can be financed (Finance).
- Has an understanding of how basin managers can involve stakeholders (Involving Stakeholders).
- Has an understanding of how basin managers go about strategic planning (Strategic long-term planning).
- Can formulate what basin managers need to consider in developing and implementing basin action plans, and how can they get feedback on how plans are progressing (Basin action plans).
- Can describe what data and information management systems basin managers need for integrated water resources management (Basin information systems and monitoring).
- Can formulate the key communication issues basin managers need to consider (Communication).

### Contents

Master, internship and job orientation in environmental research and management by

- Lectures by teachers and professionals;
- Group assignments sometimes based on application software dealing with environmental management issues.

These teaching methods are related to the objectives mentioned above.

### Literature



The following study material will be provided:

- a student manual with general course information (downloadable via Blackboard);
- a reader with (additional) theoretical background documents (downloadable via Blackboard);
- relevant literature and information on the excursions and visits (e.g. booklets, background information).

#### **Examination**

The course will be evaluated by assessment of the assignments and a theoretical examination. Absence at sessions without having reasonable grounds and/or a negative assessment of the participation, input and working attitude leads to student's exclusion from the final assessment of the course.

## Environmental Economics for Water Management

Course ID: **MM018A** 3 ec 6-12 till 17-12-2010

D.F. Boezeman  
prof. dr. A.J.M. Smits  
prof. dr. ir. W.T. de Groot

### Teaching methods

- 14 hrs lecture
- 3 hrs question session

### Prerequisites

- obligatory for TWM students
- elective for all 3<sup>rd</sup> and 4<sup>th</sup> year students of Radboud University

### Objectives

The main objective of this course is to introduce students with basis concepts put forward by economic theory to deal with issues related to the environment and natural resources. During this course students will learn (1) how economic thought with respect to the environment and natural resources has developed historically, (2) how economists understand the causes of environmental degradation, (3) which concepts economics have put forward to assess the value of ecosystem services, and (4) what policy concepts economists developed to contribute to the sustainable management of resources. During this course the student will learn how to link theoretical notions to real-world water management cases. After this course the student:

- Should have a good understanding in how economics conceptualizes and understands the driving forces of environmental problems
- Is able to critically reflect on the added value of economics for decision making
- Is able to apply course insights to a real-world case study
- Is able to orally present the essence of a 'classic' environmental economic paper

### Subjects

This course gives students an introduction to basic concepts of environmental and natural resource economics. During this course topics that will be dealt with are:

- - The history of environmental economic thought.
- - Economic concepts to analyze the causes of environmental damage
- - Economic valuation methods of ecosystem services
- - Economic policies to contribute to the sustainable management of natural resources

### Literature

To be announced.

### Examination

Closed-book written exam (70%) and participation/quality of assigned and own responses (30%)

## Water Governance and Spatial Planning

Course ID: **MM022** 3 ec

3-1-2011 till 14-1-2011

dr. S.V. Meijerink  
dr. M.A. Wiering

### Teaching methods

Lectures  
Tutorials

### Prerequisites

Obligatory for TWM students; elective for all 3rd and 4th year students of Radboud University

### Objectives

The objectives of the course are:

- To supply students with a basic insight in the state of the art in water resources management and planning
- To introduce students to recent developments in the relationships between water resources management and spatial planning and to provide students with an integrated perspective and understanding of the relationships involved, both theoretically as practically.
- To provide students with the skills to analyse developments in the integrated field of water management and spatial planning, with the use of institutional or other relevant social theories.
- To illustrate this with concrete river management cases, linked to spatial planning.

To provide students with the skills to analyse the illustrated practical cases in the field and to develop strategies to a better coordination between water management and spatial planning.

### Contents

This course aims to help students reading, understanding and using the social science literature on water resources management and planning. The empirical focus is on the key-themes of present-day water management, such as the coordination between water management and spatial planning, flood risk management, the implementation of the European water framework directive and cross-border river basin management. Although the focus is on recent developments in Dutch water management primarily, there is a strong international dimension as well. Part of the literature deals with issues of cross-border cooperation and the development of the European water regime, and some topics are discussed from an international comparative perspective.

Theoretically, in this course various institutional perspectives are used (1) to better understand recent developments in water resources management and planning and (2) to develop strategies for contributing to a better coordination between water management and spatial planning, and a more sustainable development of water resources.

### Subjects

Nexus between water management and spatial planning  
International river conflicts

The European water regime

Transition management

Flood risk management

Long term developments in water management and spatial planning

**Literature**

A set of journal articles

**Examination**

Written exam

## **Social Aspects of Water Management**

Course ID: **MM021** 3 *ec*

22-11 till 3-12-2010

prof. dr. ir. W.T. de Groot

## **4 Courses of the different orientations in Environmental Sciences**

### **4.1 Master courses of the M&T-orientation**

## Business & Society

Course ID: **FMT001C** 5 ec

first semester

dr. G.A.N. Vissers  
dr. J.W. van Rooij  
H. Vreugdenhil-de Klerk

### Teaching methods

- 28 hrs lecture

### Prerequisites

Master student FNWI

### Objectives

Business & Society is concerned with the processes of mutual influence that exist between firms, the economy and society. It specifically focuses on three industrial revolutions that fundamentally reshaped firms, technologies, and societies. Business & Society tries to understand how companies work, and it places them firmly in their context. By doing so, Business & Society introduces theories, models and concepts that aim to understand the relations between firms, the economy, and society.

Business & Society has the following specific objectives:

1. After completing this course, students understand the effects of society on business, and the effects of business on society, i.e.
  - a. Students are able to relate the behavior and characteristics of firms to characteristics of societies.
  - b. Students are able to analyze this relation using theories, models, and concepts from management science, business history, and institutional economics.
2. After completing this course, students understand the relevance of history for understanding business and society, i.e.
  - a. Students are able to analyze how events of the past have enabled and constrained future events, and as such have shaped the present.
  - b. Students are able to evaluate the role of history in the theories, models and concepts used to explain the relations between firms, the economy and society.

### Contents

The master track Management & Technology focuses on the interface between science, technology and business. Subsequent courses focus on one aspect of this interface, but in Business & Society we focus on the interface itself, and provide a helicopter view of firms in their environment. It is essential to take a broad view of the workings of business. Inside firms, different disciplines do not work in isolation, but work together to provide value on a market. Moreover, firms do not operate in a vacuum, but operate in a context that shapes them; vice versa, firms shape their environment. Business & Society sets the scene for the courses of Management & Technology that follow.

Business & Society focuses on four leading capitalist nations, and particularly on leading firms from those nations, over a the course of three industrial revolutions up to the twenty-first century. The study of history provides the means to understand how firms and their environments shape each other. The study of history also underlines that each firm and each

society is different, and underlines that firms and their environments change. In this way, students are introduced into the workings of business in its economic, technological and societal context.

Subjects that are covered in this course include:

- Industrial revolutions;
- Innovation systems, business systems, and varieties of capitalism;
- Business history, particularly of leading firms in the 19th and 20th centuries;
- Entrepreneurship;
- The role of the state in the economy.

### **Literature**

T. K. McCraw, Ed. (1997). *Creating modern capitalism: How entrepreneurs, companies, and countries triumphed in three industrial revolutions*. Harvard University Press.

### **Examination**

Written exam, group work and individual assignments make up the final grade for this course. More details will be announced on Blackboard at the start of the course.



## Organization Theory

Course ID: **FMT002C** 5 ec

spring semester

prof. dr. B. Dankbaar  
H. Vreugdenhil-de Klerk

### Teaching methods

- 30 hrs question session

### Prerequisites

MT Course Business & Society

### Objectives

- Students acquire knowledge of the main concepts and approaches in organization theory
- Students are able to apply this knowledge to issues of organizational design and change

### Contents

This course offers an introduction into the fundamental insights of organization theory dealing with questions like: What are organizations? How are they structured? How do they interact with their environment? What is organizational culture? And how are organizations designed and managed? Organizations are complex systems and consist of people with different interpretation-schemes. As a result, organizations have to deal with a variety of problems and dilemmas. The course offers students methods and instruments to diagnose organizational problems and to deal with the problems and dilemmas of organizing.

Content:

Apart from studying and discussing a text on organization theory, the students will make presentations of their analysis and views on selected business cases

### Literature

To be determined

### Examination

Written examination and discussion of a business case

## Innovation management

Course ID: **FMT003C** 5 ec fall semester

prof. dr. B. Dankbaar  
H. Vreugdenhil-de Klerk  
ir. L.J. Lekkerkerk  
dr. R.A.W. Kok

### Teaching methods

- 32 hrs lecture

### Prerequisites

- Master student FNWI
- BEM & Organisatiekunde in completion with a minimum of a 6

### Objectives

The purpose of the course is for students to :

- Acquire knowledge in the field of innovation management including Research and Development and New Product Development
- Apply this knowledge in theoretical cases, eventually acquire sufficient knowledge to apply this knowledge in 'real life' settings
- Judge the value of scientific knowledge in the field of innovation management including Research and Development and New Product Development
- Learn how to design a research project in this field

### Contents

Innovation determines the dynamics of the economy. Organizations innovate to stay viable. This course focuses on issues of innovation from a management perspective. The main issues concern the dilemmas of innovation management and innovation enhancement: how (and to what extent) are these processes manageable? In these processes different factors play an important role, such as creativity, entrepreneurship, structure, linkages, and a bit of luck. This course offers the student knowledge about the structure and nature of the innovation process (product as well as process innovation). Furthermore, it offers the students instruments to cope with the different dilemmas of innovation management.

Content:

The following themes will be treated:

- Managing for innovation
- Strategy
- Establishing effective external linkage
- Building effective implementation mechanisms
- Creating the innovative organization
- Assessing and improving innovation management

### Literature

To be determined (See Black Board)

**Examination**

assignments and a written exam

## Strategy & Marketing

Course ID: **FMT004C** 5 ec

fall semester

dr. P.E.M. Ligthart  
dr. ir. N.G. Migchels  
H. Vreugdenhil-de Klerk

### Teaching methods

- 30 hrs question session

### Prerequisites

- Master student FNWI
- BEM & Organization Theory in completion with a minimum of a 6 ECTS

### Objectives

After completion of the course, students are familiar with market oriented views of innovation and with several important forms of market research; they are able to describe the circumstances in which market orientation will influence innovation processes and to discuss the nature of such influence for business and product development. Students will also be familiar with strategy formation, with different types of strategy and the related perspectives, and with the relationships between general business strategy and innovation strategy.

Prime course objectives are that:

- participants acquire updated insights regarding challenges and opportunities in high-tech markets
- participants understand the virtue and limitations of traditional strategic marketing thinking and tools in emergent, high-tech markets, and
- participants apply their understanding of strategy and marketing concerning High-Technology to develop a well-founded business plan within their own technological discipline.

### Contents

Description:

Marketing is the business function that deals with discovering and meeting customers' unfulfilled needs and wants. Strategy underlines the need to align this function to the objectives of the business, the other business activities and -last but not least- to the external market environment of the firm. Strategic marketing in high technology environments poses its own unique challenges due to the complexity and novelty of the technology. Some of those challenges include articulation of the value proposition, decision making with limited information on customers, and coordination with other market players. In order to succeed in this environment, firms need to be able to understand unarticulated needs, forecast the development of nascent markets, and position themselves appropriately in the competitive landscape.

High-tech firms operate under conditions characterized by high degree of market and technological uncertainty. Technological changes can occur rapidly. Products offered are novel and for buyers often difficult to evaluate. Moreover, high-tech firms often operate in emergent industries with "fuzzy" and rapidly changing industry boundaries. Such conditions - deviating from those captured in most marketing texts- represent specific challenges for high-

tech firms to survive and prosper. It should also be noted that the rapid developments in modern technologies within science (e.g. biotechnics, informatics, chemics, mathematics, etc.) exert influence on markets and marketing practices only superficially dealt with in traditional strategic marketing textbooks. The "driving question" that arises from the situation described above is: "Provides strategic marketing added value for firms operating in high-tech markets?" And, if so, "why and how?"

The focus of this course will be on the strategic marketing to accompany a technology and not on the technical or scientific aspects of the high-tech products. Besides lectures, students will work on a group project (i.e. to set up a High-tech Business Development Plan) throughout the term to analyze the marketing strategy for a technology-based product or service.

This course focuses on issue related to strategy and marketing of firms, such as:

- Technology and market
- Relation between R&D and Marketing
- Business strategy and product strategy
- Market research
- Relation with customers
- Distribution, supply chain and pricing

### **Literature**

Mohr, Sengupta, Slater (2005) **Marketing of High-Technology Products and Innovations** (2nd international edition) Pearson Prentice Hall, ISBN 0-13-123023-9  
Reader (links of articles will be published at Blackboard)

### **Examination**

- Written exam (literature)
- Business Development Project (presentation and report)

## Finance & Accounting

Course ID: **FMT005C** 5 ec spring semester

drs. R.A. Minnaar  
H. Vreugdenhil-de Klerk

### Teaching methods

- +/- 15 lectures (see for detail Black Board)
- practices

### Prerequisites

Master student FNWI

### Objectives

The financial accounting part should give you a firm understanding and working knowledge of:

- The basic accounting terminology and the process for recording, summarizing and reporting economic events of a business enterprise;
  - The interpretation and analysis of financial statements as a basis for business decisions.
- The management accounting part is to develop the student's knowledge of the process of evaluating performance and decision making using accounting information as a basis. After taking this course you should be able to interpret, use and evaluate internal accounting information.

### Contents

Accounting information is an integral part of the business environment and an understanding of accounting information is an essential tool in the process of making business decisions. The primary objective of this course is to develop the student's knowledge of accounting as a tool in making business decisions. The emphasis in this course will be on both the user and the preparation of accounting information in a business context.

Content:

This course consists of two parts. Financial- and management accounting.

In the financial accounting part, you will be introduced to accounting theory and practice using the models of sole proprietorships and corporations, with an emphasis on merchandising companies. The emphasis and focus of financial accounting is on financial information used by parties' external to the firm. Specific topics will include: the definition and scope of accounting; systems used to account for and control transactions; inventory costing; the measurement of income and equity; and a special emphasis on financial reporting and the analysis of financial statements.

The management accounting part of this course emphasizes the use of accounting information for internal planning and control purposes. As business managers, you will be involved in a variety of management decisions. Some examples of the issues that you might encounter include: "How much should we charge for this product or service?"; "What elements contribute the most to this business?"; "How is my company doing compared to the competitors?"; "Is this person a good manager?"; "Are my costs under control?" "Does this capital investment make sense?" A range of information may influence such decisions and management (internal) accounting information is among the most significant.

In this part, the fundamentals of managerial accounting, profit and cost accumulation are introduced. Specific topics covered include: cash flows, capital budgeting, cost allocation, product costing, differential costing for short and long-term decisions, performance evaluation, and the concepts related to the time value of money.

**Literature**

Horngrén, Harrison and Oliver (2009). Accounting. Eighth edition. Pearson International Edition. ISBN: 0-136-11290-0

**Examination**

- A final written 3 hour exam with multiple choice questions.
- Online Assignments in MyAccountingLab

## Master-thesis Management & Technology-track

Course ID: **FMT010B** 27  
ec

dr. J.W. van Rooij

### Teaching methods

- 40 hrs personal study counseling

### Prerequisites

The master thesis Management & Technology is open to master students who have successfully completed

- the compulsory courses of the master track Management & Technology, and
- the compulsory courses in their own discipline, including a research project if applicable.

Students need to show that they are eligible to enroll in the final research project by providing the coordinator with a list of completed courses.

### Contents

The master thesis is the final step in the master track Management & Technology. Students perform research, focusing on problems on the interface of science, business and society. Preferably, students combine knowledge acquired in their discipline with knowledge acquired in the master track Management & Technology. We encourage students to perform their research in companies, but students can also work in non-profit organizations if they prefer, and if the problem fits with the objective, and contents of Management & Technology. After students have shown that they are eligible to enroll, the project consists of the following stages.

- In the first stage, students find an organization willing to host and coach them, and, in consultation with this organization, write a research proposal. In the research proposal students outline the topic of the research and its goals, the research questions, and the methods that will be used to answer these questions. All parties need to reach an understanding of their respective roles and responsibilities; a standard contract is available to formalize this understanding. At the end of the first stage, finally, the coordinator assigns to the student a coach who will supervise the final two steps of the project.
- In the second stage, students perform research and write their thesis. In this stage, students meet regularly with their coaches from the host organization and the university to discuss progress and planning, as well as possible problems. At the end of stage 2, the coach from the university assigns an additional reader to the project; this reader acts as a quality check on the work of students and coaches.
- In the final stage, the results of the research are presented at the university, and at the host organization if desired.

A manual is available on Management & Technology's website with more details, help, examples and literature.



### **Literature**

See the manual on the website of Management & Technology.

### **Examination**

Coaches and reader together decide on the grade of the thesis. Coaches and reader determine their grade on the text of the master thesis, on the performance of the student during research and writing (stage 2), and on the form and content of the presentation (stage 3). The manual on the website of Management & Technology details the criteria that will be used.

## **4.2 Master courses of the C-orientation**

## Introduction Science Communication

Course ID: **FC001B** 3 ec

first quarter

dr. J.G. van den Born  
drs. E. van Rijswoud  
S.A.J. Segers

### Website

[www.ru.nl/sciencecommunication](http://www.ru.nl/sciencecommunication)

### Teaching methods

- 14 hrs lecture
- 70 hrs individual study period

### Prerequisites

This is the first course of the Mastertrack Science Communication. It is part of the obligatory programme of the Mastertrack. In addition the course is open as an optional course for all MSc. students.

### Objectives

- Students are acquainted with science communication practices and theories
- students are able to use these theories to analyse classic examples of science communication
- Students are trained by a professional in presentation skills

### Contents

Nowadays every scientist gets involved in science communication in his or her professional life. In this course we give an overview of science communication strategies and of seminal views on science communication practices and theories.

Focus is on communication with the public and with target groups within the general public on issues that involve scientific knowledge. Scientific communication (communication among scientists for instance at scientific meetings) is not the main issue, although the training in presentation techniques applies to those communication practices as well.

Students will also study and present classic examples of succesful popularization of scientific insights, in the shape of TV documentaries, films, fiction and non-fiction books, and 'visitables'.

### Literature

Literature will be made available on blackboard

### Examination

Written exam, participation and presentation

### Extra information

This course will be taught in Dutch.

## Science & Societal interaction

Course ID: **FC002B** 3 ec

third quarter

dr. J.G. van den Born

### Website

[www.ru.nl/sciencecommunication/](http://www.ru.nl/sciencecommunication/)

### Teaching methods

- 14 hrs lecture
- 1 hrs personal study counseling
- 69 hrs individual study period

### Prerequisites

Basic articles from the reader of the course: 'Introduction Science communication'.

### Objectives

The student:

1. develops knowledge and understanding in the field of public participation, regarding natural-scientific topics in societal processes.
2. applies this knowledge by developing a participation-plan. Attention is paid to different levels of participation and methods and tools of participation. Also, a distinction of the different stakeholders is made, and ways to reach them are explored.
3. is able to present this participation-plan to the group.

### Contents

Science communication is usually not a linear process, but comes into being through interaction. In this course is dealt with ways to involve citizens and other stakeholders in an interactive process when scientific topics are on the agenda. Questions as why would you involve stakeholders and why not, who would you involve and on which level are under discussion. With regard to the question who to involve it is important to get a grip on 'the public'; who will and can be involved? And what are the benefits for people to participate in such a process? Finally, we learn about the different methods and tools that can be used in the planning of a participation project, such as debates and focus groups.

In this course the students are introduced in the basic principles of stakeholder participation, students design a participation plan themselves and debate with experts on the field of participation on an actual case.

### Literature

Literature will be made available on Blackboard

**Examination**

An assignment.

**Extra information**

Thursday

Foreign students should contact the teacher 6 weeks in advance.

## Risk Communication

Course ID: **FC003B** 3 ec

second quarter

dr. R.P. Verhoeff  
dr. J.G. van den Born  
S.A.J. Segers

### Website

[www.ru.nl/sciencecommunication/](http://www.ru.nl/sciencecommunication/)

### Teaching methods

- 1 hrs personal study counseling
- 20 hrs problem session

### Prerequisites

The course builds on the introductory course on Science Communication from the Mastertrack Science Communication, and is part of the obligatory part of the Mastertrack. In addition, the course is open as an optional course for all MSc. Students.

### Objectives

- Students are familiarised with the place of risk in society, its characterisation, and the implications for communication
- Students are familiarised with actual cases and practices in Risk and Uncertainty Communication
- Students are familiarised with determinants of public perception of Risk and Uncertainty
- Students are familiarised with the role of the different actors and stakes in Risk Communication (for instance companies, government, local population) and how to position themselves among these actors

### Contents

Present day society has been characterised as a Risk Society. In the last decade, the risk society has been hugely influential, serving as a stimulus for academic, environmental and political dialogue. The communication of risk and the public understanding of risk have become important issues in Science Communication. This course aims to prepare students to actively engage in risk communication and to analyse, reflect on and assess risk communication practices (e.g. HPV-vaccination, the Mexican flu, global climate change). The course combines a practical and theoretical component. Discussions among students, teachers and guest speakers are matched with analyses of current scientific insights on issues of risk communication, risk perception and uncertainty.

### Literature

Literature will be made available on Blackboard

### Examination

assignment

**Extra information**

Thursday 15.30-17.30

Foreign students should contact the teacher 6 weeks in advance.

## Framing Knowledge

Course ID: **FC0010C** 3 ec

first quarter

dr. J.G. van den Born  
S.A.J. Segers

### Website

[www.ru.nl/sciencecommunication/](http://www.ru.nl/sciencecommunication/)

### Teaching methods

- 14 hrs lecture
- 70 hrs individual study period

### Prerequisites

The course 'risk communication' is recommended.

### Objectives

The student:

- will be introduced in the theory of frames and framing (knowledge)
- will have insight in the role of perceptions, interests and strategies in conflict situations (knowledge)
- can cooperate in a group of fellow students with regard to the assignment (skills)
- can design an interview guide, learn to interview, and to work out and interpret the interview results (skills)

### Contents

Framing knowledge is an introduction into perceptions; frames that individuals use to look at and understand the world around them. It is important to be conscious of the fact that everyone has their own background and knowledge structures. For example, a farmer has a different idea of what nature is than a city dweller, and a scientist has a different perception of a laboratory animal than an ethicist. Besides, this so called cognitive approach, we distinguish the interactional paradigm. This approach centers on how parties negotiate meaning in interaction.

When looking closer at laborious and failed negotiations, it is not impossible that different perceptions are underlying the whole matter, perceptions the stakeholders are often stuck to. To recognize these frames is the first step of understanding and solving a conflict. Connected to these frames are individuals (or groups) interests and strategies to act and negotiate. In these negotiations frames may develop and shift during the process.

We work with a recent case study (closely connected with PhD research performed at our ISIS institute) to explore the idea of frames. In this course the students are also introduced to the basic principles of interviewing. They learn to design an interview guide and to perform an interview with a stakeholder in the case we investigate during the course.

### Literature

Literature will be made available on Blackboard

**Examination**

An assignment.

**Extra information**

Foreign students should contact the teacher 6 weeks in advance.



## Knowledge Society

Course ID: **FC0011C** 3 ec

third quarter

dr. R.P. Verhoeff  
dr. J.G. van den Born  
S.A.J. Segers

### Website

[www.ru.nl/sciencecommunication/](http://www.ru.nl/sciencecommunication/)

### Teaching methods

- 7 hrs lecture
- 1 hrs personal study counseling
- 7 hrs problem session

### Prerequisites

The course builds on previous courses from the Mastertrack Science Communication (especially Risk Communication), and is part of the obligatory part of the Mastertrack. In addition, the course is open as an optional course for all MSc. Students.

### Objectives

- Students are familiarised with the different roles of scientists in the Knowledge Society
- Students are familiarised with the implications for science communication
- Students are familiarised with shifts in the knowledge infrastructure and with techniques and strategies to analyse these shifts
- Students are familiarised with the pro's and con's of multi-, inter-, and transdisciplinary-settings they will encounter in professional contexts

### Contents

Present day society has been characterized as developing towards a 'Knowledge Society'. Scientific knowledge has become more important and new technologies have a sometimes unprecedented impact. At the same time, the position of (academic) science is under pressure and apparent shifts take place in the role and authority of science in society. Knowledge is an issue.

In this course we reflect on these changes and discuss the possible implications of these shifts for MSc. students in their future professional life. We ground these discussions in actual working practice brought to the classroom by guest speakers, and complement these by models and approaches that are currently used in assessments of the Knowledge Society.

The course primarily focuses on theoretical reflection, but features discussions among students, teachers and guest speakers. These are matched with analyses of current scientific insights on the Knowledge Society, mainly from the field of STS (Social Studies of Science). The course is completed with a written exam.

### Literature

Literature will be made available on Blackboard

**Examination**

written exam

**Extra information**

The course is taught Thursday

Foreign students should contact the teacher 6 weeks in advance.

## Science & Media: strategies and trends

Course ID: **FC0013C** 3 ec

second quarter

drs. H.M. Dresen  
drs. R.P.M.M. Welters

### Website

[www.ru.nl/sciencecommunication/](http://www.ru.nl/sciencecommunication/)

### Teaching methods

- 1 hrs personal study counseling
- 20 hrs problem session
- 63 hrs individual study period

### Prerequisites

This course is part of the Mastertrack Science Communication, and also open as optional course for all MSc. students.

In either case, having completed the course **Introduction Science Communication** is a **prerequisite** for taking part in this course.

#### Dutch language:

Part of this course (i.e. the training in media-oriented writing) will be given and examined in Dutch, as it is aimed at gaining access to the Dutch media landscape. Participants who do not write Dutch need to **register six weeks in advance of the start of this course** by sending an email to the coordinating lecturer (H.M. Dresen) **asking for an English language arrangement**.

#### Limited number of participants:

The number of participants for this course is limited, due to the character of the training in media-oriented writing. Students will be accepted in the order of their registration. Students of the Science Communication mastertrack have priority in placement, if they **register six weeks in advance of the start of this course**.

### Objectives

- students will increase their abilities in media-oriented writing.
- students will increase their knowledge of strategical considerations and ethical codes involved in the process of transmitting information from the academic to the public arena.
- students will get acquainted with academic perspectives on (a) the current state of science reporting in the media, and (b) developments and trends in reporting about science and technology over the last few decades.
- students will get acquainted with different methodologies for (a) studying trends in science reporting and (b) studying public responses to media content.
- students will increase their abilities in research design.

## **Contents**

The course consists of two interrelated parts:

1. A training in media-oriented writing (given in Dutch), which will address both the process of writing itself and the broader considerations involved (both strategic and ethical) in the process of transmitting information from the academic to the public arena.
2. An introduction to the study of Science-in-the-Media, as a subfield within the academic field of Science Studies. We will look at classic and new studies that investigate the state of science reporting in the media. While studying these examples, students will also get acquainted with different methodological alternatives for researching how media represent scientific expertise.

## **Literature**

Handbook on media-oriented writing (in Dutch; can be bought, or library copies can be used at the FNWI library)

Additional reading material will be made available at the start of the course

## **Examination**

Journalistic writing assignment & research design assignment

## **Extra information**

Classes once a week, Thursday 13.30-15.30 from november 11 (2010) till january 27 (2011). (Schedule details may be subject to change; always check <http://schedule.ru.nl/> for latest version of schedule)

## **Boundary-Work: The Tension between Diversity and Sustainability**

Course ID: **FC0041C** 3 *ec*

fourth quarter

prof. dr. F.W.J. Keulartz  
S.A.J. Segers

### **Website**

[www.ru.nl/sciencecommunication/](http://www.ru.nl/sciencecommunication/)

### **Teaching methods**

- 20 hrs lecture
- 4 hrs personal study counseling

### **Objectives**

Students should gain some basic insights in the tension between the heterogeneity of actors that (should) have a stake in natural resources management on the one hand and the need for an integrated approach and close cooperation among these various stakeholders on the other. They should be able to specify and discuss general strategies of so-called 'boundary work' to deal with this tension between diversity and sustainability.

### **Contents**

Climate change, air pollution, deforestation, loss of biodiversity, stratospheric ozone depletion, land and freshwater degradation - all these environmental problems have effects that transcend national boundaries; they cannot be solved by the unilateral decisions of individual states but require international cooperation. Moreover, these problems are interconnected and cannot be solved in isolation but require an integrated approach. But such an approach is frustrated by the existing multiplicity of communities with diverse and sometimes diverging ethical visions and moral vocabularies. So, there is a strong tension between on the one hand the diversity of actors that have a stake in sustainable development and on the other hand the need for a close cooperation between these various stakeholders. This tension between sustainability and diversity can only successfully be resolved through processes of communication, conflict management and consensus building across the lines that separate communities and their social and moral worlds. Such 'boundary work' is the central topic of this course.

### **Literature**

Will be distributed.

### **Examination**

Students should study the literature, participate in discussions, make at least one presentation, and write a brief essay.

### **Extra information**

Foreign students should contact the teacher 6 weeks in advance.

### **4.3 Master courses of Transnational ecosystem based Water Management (TWM)**

Remark: The following TWM courses are all lectured in the second study term (summer term 2011) at the University of Duisburg-Essen (campus Essen) in Germany. The final responsibility for correct and updated information has the University of Duisburg-Essen. For more info also see <http://www.twm-master.com/>

- Water-borne Diseases (2 EC)
- Hydrogeology and Application (4 EC)
- Hydraulics and Sediment Transport (3 EC)
- Ecology and Protection of Freshwater Ecosystems and Aquatic organisms (5 EC)
- Hydrobiological Field Trips (2 EC)
- Water Pollution (2 EC)
- Basics in Hydraulic Planning and Facility Design (3 EC)
- Waste Water Treatment (2 EC)
- Flood Management (2 EC)
- River Basin Management (3 EC)
- Hydroclimatology and sustainable Water Management (2 EC)

## 5 Practical training

### 5.1 Traineeship Environmental Sciences in general

The master programme starts with several courses. Upon completing these, you will proceed to conduct research in environmental sciences.

Most of the research traineeships take place at the departments of the Faculty of Science or the Faculty of Medical Science. It is also possible to do a research traineeship elsewhere.

External traineeships often concern research institutions, organisations or companies (for example, RIVM, Alterra, consultancies, KEMA, ANDENO) with which the departments of the Faculty of Science maintain contacts.

In addition to a daily supervisor during the external traineeship, the student will also be appointed a supervisor at the faculty for the purpose of monitoring the progress and quality of the research traineeship. External traineeships often go hand in hand with separate traineeship agreements in which certain arrangements are made concerning supervision, responsibilities, products and traineeship allowances.

If you find it difficult to choose, then you can opt to set up an appointment with the educational advisor in order to discuss matters. You can also call upon the contact persons of the various departments for additional information concerning the research traineeships that they offer. It is important that you realise that the subjects mentioned are not exhaustive. It is often possible to propose a subject of your own, provided that it is in line with the research that is conducted at the department concerned.

The majority of the departments requires that you apply for a research traineeship at least 1 month before and no earlier than six months before the start of the traineeship. You can register for a traineeship at the secretariat of the department concerned or through one of the permanent staff members of the department.

### 5.2 Traineeship abroad

The Department of Environmental Science has various partners around Europe that participate in the exchange of MSc-students for a period of three to six months, often within the European Socrates programme. Students are eligible for scholarships that cover travel and accommodation expenses. There are special relationships with, e.g., Lisbon (Portugal), Lublin (Poland) as well as with several institutes in Indonesia, Tanzania and Curaçao. In addition, staff members have their own contacts that can be used for specific topics.

For more information you can contact Mark Huijbregts (T: 024-3652835; e-mail: [m.huijbregts@science.ru.nl](mailto:m.huijbregts@science.ru.nl)) or Marlie Becks (T:024-3653285; e-mail: [m.becks@science.ru.nl](mailto:m.becks@science.ru.nl)).

## 5.3 Research Environmental Specialism

### Research Environmental Specialism

The traineeships in an environmental specialism are at Departments of the Faculty of Science or the Faculty of Medical Science. These departments are responsible for the topics of research.

### Guidelines traineeship environmental specialism

#### *Guidelines traineeship environmental specialism*

The following guidelines apply to every traineeship for students that started ES in 2010 regarding an environmental specialism:

- The traineeship is to correspond to a total of 36 credits (approx. 7 months).
- The traineeship is to be evaluated in the form of 1 final marks, namely:
  - a mark for the practical work and the report (corresponding to 36 credits) and
- A traineeship is to essentially be carried out under the responsibility of a staff member with a teaching commitment at the Faculty of Science or the Faculty of Medical Sciences of the RU.
- The traineeship is to concern the identification and/or analysis and/or solving of environmental problems from a disciplinary angle, namely a biological, chemical and/or physical environment specialism.
- The subject of the traineeship is to be submitted to the examining board prior to starting the traineeship.
- The subject of the traineeships is to be presented to the contacts of the various environment specialistic departments. The examining board will reach a decision after having consulted with these persons.

#### *Aim of the environmental specialism research traineeship*

- The student can independently set up and conduct scientific, environment specialistic research.
- The student has environment specialistic knowledge of one or various subsectors.
- The student is able to report and to communicate the results of the environment specialistic research in a clear fashion.
- Specific goals that are formulated from an environment specialistic angle.

#### *Themes*

Presentation of environment specialistic issues and research results. Subsequent themes that are to be formulated from an environment specialistic angle.

#### *Form of training*

Practical work, including reporting, progress discussion, other components as these are required by the responsible department, such as a lecture or thesis.

#### *Maintenance*

The responsibility lies with the departments of the Faculty of Science and the Faculty of Medical Sciences.



*Literature*

To be determined by the responsible departments.

**Topics for research research work in environmental specialism***Topics for research work in environmental specialism*

The departments below participate in the academic training and provide environment-oriented research traineeships with respect to the subjects described below. In addition, you may also do a traineeship at the other departments that make up the Faculty of Science or the Faculty of Medical Sciences if department concerned agrees to this and the nature of the subject of the research traineeship concerns environmental sciences. The examining board of Environmental Sciences must at all times approve these options. The list below is therefore not exhaustive.

**Department of Aquatic Ecology Environmental Biology** (contact person: Prof.dr. J.G.M. Roelofs):

The main topics of the department are within the field of restoration ecology and climate ecology. Current projects include research on wet and dry forests, heathlands, peat bogs, minerotrophic peatlands, dune slacks, river floodplains, soft water ecosystems and chalk grasslands. The main aim is to determine the biogeochemical and biological key factors and key processes related to climate change and other anthropogenic changes, knowledge of which is vital for the restoration of (heavily) disturbed ecosystems.

*Research topics:*

## Climate change:

1. Effects of increased CO<sub>2</sub> concentrations on C-limited lakes in Europe;
2. Reconstructing the Mid Eocene climate; an actual study of *Azolla*.

## Restoration:

1. Restoration of fens, lakes and marshes;
2. Restoration of zinc-related vegetation types;
3. Restoration of alder carrs in former river meanders;
4. Restoration of raised bogs;
5. Rehabilitation of nature on former agricultural areas.

## Eutrophication:

1. Biogeochemistry, carbon cycling and eutrophication in freshwater wetlands;
2. Reversibility of nitrogen saturation in forest ecosystems;
3. Liming of acidified Norwegian lakes: effects on water quality and vegetation.

## Ecotoxicology:

1. Heavy metal pollution in river Pilcomayo, Bolivia: effects on fish communities and food webs;
2. Sulphide toxicity to freshwater wetland plants and soil macrofauna;
3. Aluminum and ammonium toxicity in terrestrial and aquatic plant species.

For more information see: <http://www.eco.science.ru.nl/mibiol/mibio.htm>

**Department of Microbiology, IWWR** (contact person : dr. Huub J.M. Op den Camp):

The research of the department of Microbiology is focused on freshwater ecosystems with major emphasis on biodiversity and activity of microorganisms in their natural habitat. How do bacteria adapt to their environment? Do their activities differ in time and place? Our interest is directed towards the hyperdynamic oxic/anoxic boundary between sediment and water. Besides ecological aspects, we also study the physiology and biochemistry of relevant trophic groups of bacteria. So research activities go from sub-cellular to organism and population levels. Within our research many topics are related to environmental questions. This is illustrated in the following projects:

- Removal of volatile sulfur compounds from waste gas: isolation of specialized microorganisms and their application in biotrickling filters.
- Removal of nitrogen compounds from wastewater: the population dynamics of nitrifiers, denitrifiers and anaerobic ammonium oxidizing bacteria (anammox) are studied using 16S rRNA gene analyses and fluorescent probes (FISH).
- Methane oxidation in peatlands. The production and degradation of methane in wetland ecosystems determine the flux of this greenhouse gas to the atmosphere.

For more information look at the Web-site of the department at:

<http://www.ru.nl/microbiology/>

**Department of Organic Chemistry** (contact person: prof. dr. R.J.M. Nolte):

- Study of (bio)catalytic processes, reduction of process waste.
- Process optimization in microreactors, reduction of undesired side products.
- Development of environmentally friendly catalytic (oxidation) processes.

**Department of Applied Material Science** (contact person: dr. P.R. Hageman):

- Classical III-V semiconductors for high efficiency solar cells (*Dr.ir. J.J. Schermer*)  
Goal of research: Research activities within this topic aim to increase the efficiency of III-V solar cells by the development of a monolithic InGaP/GaAs tandem cell, which utilises the solar spectrum much better than a single junction solar cell. In this respect one of the most important goals is to develop thermally stable tunnel junctions as optically transparent, low resistivity interdevice ohmic contact between the InGaP and the GaAs cells in the tandem structure. Parallel to the research on efficiency increase, studies are performed to reduce the amount of material (thus costs) presently used by the production of high-efficiency III-V solar cells.
- Wide bandgap GaN substrates for high power optical devices (*Dr. P.R. Hageman*)  
Goal of research: In many application areas, for instance those related to optical storage, projectors, and lighting operating at high power levels, the replacement of incandescent light bulbs by solid state devices will have many advantages. Higher intensity, much longer lifetime, shorter wavelengths, higher storage capacity, reduced power consumption, are to be expected. This motivates the very large interest the III-nitride system (AlGaInN), which is very promising because of its excellent material properties, especially its high, direct, and tunable bandgap. These GaN based solid state devices are preferably deposited on GaN substrates. However, these are currently not commercially

available and alternatively, non-lattice matched substrates like sapphire are employed which reduce the efficiency of blue lasers and GaN based electronics considerably. The research is directed at the development of these GaN substrates. Not only the deposition of thick GaN layers but also the development and modelling of suitable reactors is studied.

For more information look at the Web-site of the department:  
<http://www.ru.nl/AMS>

#### **Department of Molecule and Laser Physics** (contact person: Dr. Frans J.M. Harren)

The applied spectroscopy is used for the detection of trace gases under atmospheric conditions. For this, advanced high power lasers are used in combination with various spectroscopic techniques. The research is focused on the development of new techniques to widen the amount of applications in:

- Research on trace gases emitted into the atmosphere from biological and/or anthropogenic sources.
- Research on combustion processes to reduce the exhaust from Diesel engines.
- Atmospheric research on the influence of aerosols on the Earth's radiation budget.

To enter the department as undergraduate Master student it is advisable to attend the course Atom and Molecular Physics (6 EC)

Do you like to know more about the research at the department please contact us or visit our website [www.science.ru.nl/mlf](http://www.science.ru.nl/mlf)

#### **Department of Epidemiology and Biostatistics** (contact person: dr. P.T.J. Scheepers)

This research programme uses toxicological expertise for improvement of epidemiological studies by use of biological monitoring. Chemical markers (biomarkers) are being developed for exposure, susceptibility, and effect characterisation of carcinogenic and reprotoxic substances.

Most of this work is carried out at the Research Lab Molecular Epidemiology (RLME) and is focused on the determination of metabolites and addition products (adducts). Adducts are formed through covalent binding of exogenous compounds with DNA or proteins. The identity of these products is characterized using mass spectrometry. Next, the method of quantification is improved and validated in field studies.

More information can be obtained at: [www.ebp-umcn.org](http://www.ebp-umcn.org)

## **5.4 Research Environmental Science**

### **Research Department of Environmental Science**

You will be supervised by a staff member of the Department of Environmental Science. Students are requested to contact the department 6 months before the start of their major, to allow for an adequate planning of the supervision. The intake consists of registration at the secretarial office and an interview with the coordinator (Mark Huijbregts) who will help to select a subject that meets the interest and education profile of the student.

Duration

36 ec (= 7 months)

After completing a student should be able to:

- design, organize and carry out research in the field of environmental science.
- contribute to analyses and solutions of environmental issues in a innovative way.
- apply environmental research methods for the analysis of environmental issues.
- collect, select and integrate data into environmental concepts.
- derive recommendations for environmental management from results of research.
- report and communicate the results to target groups in science and society.

### **Research themes at the Department of Environmental Science**

We aim to understand and predict biological responses to physical and chemical pressures. Our research focus is on the impact of reconstruction and pollution on plant, animal and human populations in the rivers and estuaries of the Rhine and Meuse basin. We build and apply conceptual and mathematical models in cooperation with laboratory and field experts. Our students are trained to become professionals in research, management and consultancy on environmental, nature and water issues. As we are both interested in and dedicated to environmental problems, we develop scientific knowledge and implement it in society.

#### **Focus 1: Reconstruction and pollution in the Rhine-Meuse basin**

Western Europe in general, and the Rhine and Meuse delta in particular, have changed dramatically in the last centuries. In the past, this area consisted of natural wetlands with rivers that transported water freely from the land to the sea. Nowadays, land is intensively cultivated, heavily industrialized, densely populated, and consequently protected against flooding by dikes and dams. As a result of land use changes and high water levels, possibly enforced by climate changes in the future, the whole basin is under reconstruction. Dikes are raised and moved, summer and winter beds are excavated, obstacles are removed and emergency spillways are created. Reconstruction changes the flow of water and the level and type of the substrate altering the species composition and ecosystem functioning. Emissions of toxicants and nutrients from agriculture, industry and households cause pollution of water, sediment and air, leading to concentrations that affect plants, animals and man. Traditional pollutants are banned but new, largely unknown, chemicals are used and released instead.

Nijmegen is located at a narrow of the rivers Rhine and Meuse, between the large German and Belgian catchments areas and the Dutch delta.

As a consequence, problems throughout the whole basin are magnified in the vicinity of Nijmegen, giving good opportunities for research and education. Transitions between dry and wet, fresh and salt, pristine and heavily modified systems are nearby for detailed case studies. Students find a broad set of environmental, nature and water issues to learn from.

#### **Focus 2: Conceptual and mathematical models to integrate fragmented data from lab and field studies**

While the above-mentioned problems are inherently complex, information needed to derive solutions is scattered. Data are collected by various disciplines, in laboratory experiments and field surveys, carried out at different conditions, measuring different physical-chemical pressures and biological responses. To allow diagnosis and prognosis, coherent frameworks are indispensable. We therefore focus on the development and application of conceptual and mathematical models and databases that allow scattered information to become consistent knowledge, qualitative judgements to be replaced by quantitative assessments, causes to be linked mechanistically to consequences and understanding to be followed by predicting.

The models are in between an exact and an abstract description of reality. They should be sufficiently abstract to allow application to many cases and at the same time allow calibration and validation with data. The data needed are often collected in collaboration with other departments and organizations. In research, it allows modelling, laboratory and field experts to help each other. In education, students get the opportunity to link their own case studies to issues that they will have to deal with in their working life later. Examples of these models include BIOSAFE, USES-LCA and OMEGA.

### **Focus 3: Applied research from science to management**

We are both curious about and committed to environmental problems. Our efforts are therefore not only directed to developing scientific knowledge. We collaborate closely with organizations for environmental, nature and water management in the field of both physical and social sciences (see partners). In our assessment of environmental and ecological indicators, we include society-oriented aspects such as the perception of nature by people and the restrictions imposed by EU-directives. So far, management has been able to solve easy problems by reacting afterwards. Our models will help to anticipate and solve problems of a more complex nature.

Our research is centered on the following fields:

- rivers
- estuaries
- bogs and lakes
- risk assessment
- life cycle assessment

Recent topics for a MSc thesis include:

- Ecological rehabilitation of the Dutch river area: role and significance of some fauna species
- Historic-geographic overview of hydraulic reconstruction in the Dutch river area: a GIS approach
- The historic relationship between agriculture/hunting/fishing - nature in the Dutch river area
- Analysis of ecological characteristics in of BIO-SAFE species
- Ecological references for urban water systems
- History of excavations in the Dutch river area

- Relationships between environmental factors, vegetation and fauna in urban water systems
- Aquatic microphytes between fresh and salt water
- Coupling of hydromorphological and chemical stress to ecological response and human risk with the use of meta-analysis and simple models
- Ecological risks of dredging
- SimpleBox version 4.0 - Improvement of the oceanic compartment
- Adsorption of contaminants in groundwater with low sand and high organic content
- Reduction of ecological risks as a result of the dredging of contaminated sediment?
- Effect modelling of metals in the aquatic environment
- Effect of extreme drought on water quality and possible consequences for drinking water supplies
- Quality of sewage treatment effluents in relation to pesticides and priority substances: impact on water systems and drinking water supply

For an actual and detailed overview of topics for traineeships at Environmental Sciences we refer to [http://www.ru.nl/environmentalscience/education/student\\_research/master/](http://www.ru.nl/environmentalscience/education/student_research/master/)

#### Education and research methods

- studies: literature, modelling, lab or field (often in cooperation with other departments)
- written communication: report, publication, poster, web-site, press release
- oral communication: presentation, lecture, meetings

External traineeships are laid down in a contract with agreements on supervision, allowances for expenses, insurance etc.

Additional information can be obtained from

Mark Huijbregts: +31 (0)24 36 52 835, [m.huijbregts@science.ru.nl](mailto:m.huijbregts@science.ru.nl)

Marlie Becks: +31 (0)24 36 53 285, [m.becks@science.ru.nl](mailto:m.becks@science.ru.nl)

## 6 Annual schedule 2010-2011

### 6.1 Annual schedule of holidays in 2010-2011

The academic year and the academic training courses start on August 30, 2010.

The following holidays will be observed during the academic year of 2010-2011:

- Autumn break is not scheduled in the master's programme!
- Christmas holiday: 20-12-2010 through 31-12-2010
- Spring break: 7-3-2011 through 11-3-2011
- Good Friday: 22-4-2011
- Easter Monday : 25-4-2011
- May break: Saturday 30-4 through Friday 6-5-2011
- Ascension: 2-6-2011
- Day after Ascension Day: 3-6-2011
- Whit Monday: 13-6-2011
- Foundation day celebration: Thursday 19-5-2011
- Summer holiday: 18-7-2011 through Friday 26-8-2011.

The schedules of the courses can be found in full on [www.ru.nl/schedule](http://www.ru.nl/schedule)

### 6.2 Annual division in terms

A year is divided in 4 terms. Some courses are lectured during a specific term.

The exact dates of every term in 2010-2011 are:

Quarter 1: Monday 30-8-2010 till Friday 5-11-2010

Quarter 2: Monday 8-11-2010 till Friday 28-1-2011

Quarter 3: Monday 31-1-2011 till Friday 15-4-2011

Quarter 4: Monday 18-4-2011 till Friday 15-7-2011

## 7 Appendices

### 7.1 Composition of committees

#### **The members of the examining board of the academic programme of Environmental Sciences**

- Dr. R.S.E.W Leuven (chairman)  
T: 024-3652096  
e-mail: r.leuven@science.ru.nl
- Ms. drs. H.J.W. Becks (secretary)  
T: 024-3653285  
e-mail: m.becks@science.ru.nl
- Dr. M.A.J. Huijbregts
- Dr. A.M.J. Ragas
- Prof. dr. A.J.M. Smits
- Dr. P.H.M. Klaren

**The programme committee of Environmental Sciences forms one team together with the training committee of Biology and is named the training committee BioSciences.**

The participants of Environmental Sciences are:

- Dr. H.J.R. Lenders  
T: 024-3652096  
e-mail: r.lenders@science.ru.nl
- Prof. dr. A.J. Hendriks  
T: 024-3652932  
e-mail: A.J.Hendriks@science.ru.nl

For contacting the **student members** the general e-mail address is:

olc.biologie@student.ru.nl

Info studentsite: <http://www.student.ru.nl/olc.biologie/>

### 7.2 Honours programme

#### **For students with a broad view of the world**

The Honours Programme of the RU Nijmegen will start again in the academic year 2009-2010. With this programme, the Radboud University Nijmegen offers students from every training programme the opportunity to have a look beyond the boundaries of their own field of study in a structured fashion and under intensive supervision. The idea is not to superficially study a randomly chosen subject, but rather to independently examine



significant scientific, cultural and philosophical themes with an open-minded and broad view, without letting yourself be limited in advance by the perspective of your own scientific field.

### **Who can participate?**

The Honours Programme is intended for all of the students of the RU Nijmegen who have completed their foundation course and who are extra motivated to acquire a broad outlook in a manner that is not without obligations. There are no costs involved in participating. The programme is not part of the regular training programmes of the faculties.

The students who apply will be offered a prestigious programme that will prove to be an added value in the course of their further studies and career.

### **A prestigious programme**

The courses are provided by top-class teachers of the faculties of the RU Nijmegen. During their courses, they often include guest speakers from other sciences and, in some cases, reputable speakers from social or cultural fields as well. The number of participants per course is generally limited to a maximum of 25 students. And so the students are provided intensive and personal supervision.

Workshops, study weekends, excursions and working visits will make up part of the programme as well, if such is useful for the study of the themes. It goes without saying that a lot of attention will be paid to the quality of the course aids that will be made available to the students free of charge.

A prestigious programme also means that active studying and involvement is expected of the students who participate. The total scope of the Honours Programme is around 600 hours, which are divided between four courses (one course per semester). Of course, it is possible to take more than two years to complete the programme in the event of a traineeship abroad or some other valid reason. It is explicitly expected that the students who begin with the programme do actually complete it.

The courses generally take place on Tuesday or Wednesday evening during the academic year from 18.00h until not later than 21.00h in the Aula-Conference Hall. The students will be offered sandwiches during the break.

### **Composition of your choice**

The student is offered various courses per semester. You are free to choose what you prefer. This will allow you to determine for yourself what you want to focus on in your personal version of the Honours Programme. For the sake of coherence, it is sometimes desirable to take some of the courses that are scheduled in successive periods in the order as proposed. But you can also include these courses in your own personal Honours Programme as separate components. Of course, if you would like advice concerning the composition of your Honours Programme, then you can always call upon the programme instructor who, if desired, can put you in contact with the teachers who are to give a course in the semesters to come.

## Tests

Each course is completed with a test. The educational goals and the method of testing are both explained in the comprehensive description of the courses. These are available at the Honours Programme department. The student is obligated to be present during the lectures and to participate in the workshops and excursions. The Honours Programme department keeps a record of the attendance lists and the test results. You will have completed the Honours Programme upon successfully completing four tests.

## Honours degree

If you complete the Honours Programme, then you will receive a special Honours degree from the rector during an official academic ceremony stating the nature and the number of credits of the programme. The university will propagate the major significance that it attaches to the Honours Programme to grant-issuing authorities in the Netherlands and abroad. Moreover, students who obtain their Honours degree can apply for a letter of recommendation from the rector at the Honours Programme department for the purpose of arranging a traineeship at a foreign university, for example.

## More information

If you would like more information regarding the Honours Programme, the courses and how to apply, then contact the Honours Programme department that is located in the Gymnasium, third floor, room number N.03.110A. The desk is open on Tuesday and Thursday morning from 9.00h until 13.00h and on Wednesday from 9.00h until 17.00h. Much information is available on [www.ru.nl/honoursprogramma](http://www.ru.nl/honoursprogramma) Of course, you can also call or e-mail:

Honours Programme Department  
024-3615955  
<mailto:honours@honours.ru.nl>

## 7.3 Rules and guidelines of the master

**Rules and guidelines of the Examination Board regarding the Education and Examination Regulation (abbreviation in Dutch: OER) Bachelor Biology and Environmental Sciences and the Education and Examination Regulations Master Biology, Master Medical Biology and Master Environmental Sciences 2010-2011 (concept).**

Component: guidelines concerning evaluations and decisions

### article A.1 Fraud

- a. If, during an examination, one of the observers suspects fraud or irregularities, then he/she is to inform the examinee concerned that such is the case. The examinee, at the request of the observer in question, is obligated to hand over pieces of evidence either immediately or at the end of the examination period. A refusal on the part of the examinee will be considered fraud.
- b. An official report is to be made of the supposed fraud as referred to under section a, this

under the responsibility of an observer from the faculty concerned.

c. The examination board, after hearing both the observer and the examinee, may opt to declare the (preliminary) examination invalid and moreover, the board may decide to exclude the examinee in question from participation in the next respective (preliminary) examination.

d. In the event that the evaluating university teacher suspects fraud, plagiarism or other irregularities upon marking a written paper, then he/she is to inform the student concerned that such is the case.

e. Fraud with respect to the writing of a paper in some form or other (such as a thesis, lecture or article) is understood to mean the copying, either completely or for the most part, of a paper (either published or not) by someone else, either by electrical means or otherwise.

f. Plagiarism upon writing a paper in some form or other (such as a thesis, article or lecture) is understood to mean the copying of texts that have been produced by someone else without adequately stating the source.

g. Fraud with respect to writing papers in some form or other (such as theses, lectures or articles), as well as plagiarism, can be punished by means of imposing the obligation to write a new paper on a subject as specified by the responsible professor.

## **article A.2 Evaluation result examination component**

The result of each of the components of the examination as referred to in the Education and Examination Regulation is to be evaluated by the Examination board, insofar as it has not appointed one or more examiners from its midst to that end. The examination board, or an examiner that has been appointed by the board, may consider the results of the corresponding practical assignments and papers in the evaluation of a component. The various parts of a component are weighed as follows:

### **A 2.1. Practical**

1. In addition to training in the form of lectures, seminars, verbal presentations and home study, the examination components may include a (computer) practical. In determining the final mark for the examination component, the examinee's mark for the (computer) practical must be weighed proportionate to the number of EC. A pre-condition in this respect is that the student must obtain at least a 5.50 mark for the practical and at least a 5.50 for the theoretical (preliminary) examination.

2. In the event that the theoretical knowledge behind the (COO-) practical experiments or the knowledge gained during PGO projects is incorporated as part of the (preliminary) theory examination, then the time invested in these forms of education will be recognised as part of the examination mark. It is then no longer necessary to have more than 15% of the mark for the practical contribute to the final mark for the training course. In that case, the student must obtain a pass mark for both the (COO-) practical or the pgo projects, as well as for the (preliminary) theory exam.

3. In the event that the theoretical knowledge behind the (COO-) practical experiments or the knowledge gained during PGO projects is not incorporated as part of the (preliminary) theory examination, because not all students do the same experiments for example, one could

consider to have the proportion of the mark for the practical in the final mark equal the relative study load of the practical - for example, the proportion of the mark for the practical should be 25% with respect to a 4 EC course combined with a 1 EC practical. A pass mark must be obtained for both the (preliminary) theory examination as well as for the practical - and so an unsatisfactory mark for the theory examination cannot be compensated for with a high mark for the practical.

### **article A.3 Multiple evaluation result examination component**

In the event that the results of one and the same component are evaluated by more than one examiner, either simultaneously or otherwise, then the Examination board will supervise that the examiners make their evaluation, as much as possible, on the basis of the same standards.

### **article A.4 Statement of the result**

After a (preliminary) examination has been completed, the Examination board or the examiner as appointed by the board will issue a statement (hereinafter called: statement of the result) via the students administration/examination department indicating the result.

### **article A.5 Consideration result examination component in the event of unsatisfactory mark**

In the event that a student takes a (preliminary) examination more than once without obtaining a satisfactory mark, then the Examination board, upon determining the result, will only consider the statement of the result that indicates the highest mark obtained.

*If, for example, you score a 5 for an examination and then a 4 for the re-examination, then the 5 will apply. Of course, you will still have to obtain a satisfactory mark upon taking the next re-examination.*

### **article A.6 Consideration result examination component regarding satisfactory mark**

Once an examinee has obtained a satisfactory mark or higher for a certain examination component, he/she has the right to take the examination component one more time. In such cases, the Examination board will then recognise the most favourable statement of the result.

### **article A.7 Notice and recommendation**

The examinee and/or examined person can request that the Examination board or the examiner, before making a decision with respect to the person concerned, give the supervisor or the student advisor the opportunity to provide the Examination board with information and recommendations.

*You can contact the supervisor if you have problems with a preliminary examination with the request to consider the problem in more detail and to advise the Examination board to that end.*

### **article A.8 Determining the result of the examination**

1. Once all of the components of an examination have been completed, the Examination board will proceed to determine the result of the examination.
2. The Examination board meets at least twice a year for the purpose of determining the results of examinations. At least two members of the board, along with the chairman or acting chairman, must be present at these meetings. It is also possible to determine the result of an examination by means of a procedure in writing. The judgement of the chairman or acting chairman and at least two members will be required in such cases as well.
3. The Examination board comes to its decisions on the basis of an overview of all of the study results of the person examined as this has been drawn up by the faculty department, meaning the issued statements of the result pertaining to the components that the examinee has taken.
4. The Examination board comes to decisions with a simple majority of votes. The person examined has passed if the required majority is obtained. The person examined will not pass if this majority is not obtained.

### **article A.9 Final evaluation examination components**

The final evaluation, expressed as a number, for each of the examination components is to be indicated in the form of a round number or as 0.5, with the exception that evaluations between 5 and 5.5 will be rounded off to 5.0 and evaluations between 5.5 to 6 will be rounded off to 6.0.

Some examination components may be evaluated with 'fulfilled' or 'unfulfilled' instead of in the form of a number.

### **Article A.10 Re-examination regulation**

1. Two examination-opportunities may be taken for each examination component (meaning one re-examination), this in accordance with the regulation of the Faculty of Natural Sciences. If a student wishes to take part in a third (preliminary) examination, then he/she must request the permission of the Examination board in writing, stating the reasons, at least three months prior to the date of the examination concerned. The Examination board, in consultation with the teacher concerned, may stipulate specific conditions with respect participating in the examination, such as taking certain components of the course concerned once again. The Examination board will not, in general, lend permission to participate for a fourth time in a (preliminary) examination concerning a component of the foundation course.
2. In general, there are two (preliminary) examinations per examination component per year; one following the completion of the (training) course concerned and then a re-examination.

3. Under no circumstances may a teacher grant exemption from an examination component, nor may he/she provide recommendations that are inconsistent with the registration regulation as observed by the Faculty.

4. The student has the right of appeal to the faculty of Natural Sciences in the event that the Examination board rejects the student's request.

5. As a rule, verbal examinations do not make up part of any educational programme, this due to the multi-disciplinary nature of the examination components. Requests to that end are to be submitted in writing, stating the reasons, to the Examination board, which may call upon the teacher(s) concerned or an advisor (a medical advisor, for example) for advice on the matter.

6. The examination board is to reach a decision in all cases for which this regulation does not provide.

**article A.11 Regulation for qualification for the foundation course examination.**

not applicable for the master

**article A.12 Regulation for qualification for the bachelor examination**

not applicable for the master

**article A.13. Master examination**

Students are allowed to register for the Master examination if a satisfactory mark has been obtained for all of the components. An exception to this rule concerns the examination date of August 31st. Registration prior to this date is allowed even though the student still awaits the result of one course or mark. The marks concerned must be made known at the latest on the last working day in August (generally Aug 31st).

**article A.14 Qualification regulation for the master examination**

1. The person examined is considered to have passed the master examination if all of the statements of the result pertaining to the components as specified in article 2.1 of the Education and Examination Regulation, insofar as these apply to the candidate, are at least 'satisfactory' (rounded off to 6.0 or more) and if these examination components are approved by the Examination board (Combination of subjects).

2. The examinee will be considered not to have passed the master/doctoral examination in all other cases.

3. The Examination board recognises and ascribes the classification 'with pleasure (bene meritum)', if:

a. the average evaluation of all of the examination components combined equals at least a 7.0;

*and:*

b. the evaluation of the practical assignments and reporting of the mandatory traineeships is at least 7.5.

4. The Examination board recognises and ascribes the classification 'with much honour (cum laude)', if:

a. the average evaluation of all of the examination components combined equals at least an 8.0;

b. the evaluation of the practical assignments and reporting pertaining to all of the mandatory traineeships is at least 8.5.

5. The Examination board may furthermore ascribe the classification 'with the highest honour (summa cum laude)', if:

a. the average evaluation of all of the examination components equals at least 9.0;

*and:*

b. all of the individual traineeships, in terms of practical assignments and reporting, have been evaluated at a mark of at least 9.0.

7. Examination components of which the results are not expressed in the form of a number, but rather in terms of 'fulfilled' for example, are not to be taken into consideration upon ascribing a classification.

#### **article A.15 Unforeseen circumstances**

The Examination board is to decide in any and all cases for which these articles do not provide.

Cluster Bio-Sciences

June 28, 2010

## **7.4 Exam regulations of the master Environmental Sciences 2009-2010**

### **EXAM REGULATIONS MASTER ENVIRONMENTAL SCIENCES 2009-2010**

(Mind: the rules refer to the examination regulations of 2009-2010. The new Examination Regulations are not yet accepted July 2010)

#### **SECTION 1 GENERAL PROVISIONS**

##### **Article 1.1 Applicability of the regulations**

These regulations apply to the programme and the examinations of the two year Master's degree programme in Environmental Sciences (abbr. in Dutch: ES); hereinafter called: the education programme. The programme is offered by the educational institution of Biosciences of the faculty of Science, hereinafter called the faculty.

## Article 1.2 Definitions

Insofar as they are also mentioned in the Higher Education and Research Act, the concepts used in these regulations will have the same meaning as in this Act. In these regulations the following definitions apply:

a. the Act: the Higher Education and Scientific Research Act of October 8, 1992 (GG593) as it reads currently;

b. programme: the Master's degree programme as referred to in article 7.3a, paragraph 1 under b of the Act;

c. student: anyone enrolled at Radboud University Nijmegen for participation in a degree programme and/or in the interim and final examinations of the programme;

d. bachelor's degree programme: programme as referred to in article 7.3a of the Act;

e. practical: a practical exercise as referred to in article 7.13, paragraph 2 under d of the Act, in one of the following forms:

- writing a thesis;

- - writing a paper, carrying out a project, or developing an analytical design;
- - carrying out an analytical design or a research assignment;
- - conducting a literary study;
- - writing a computer programme
- - gaining work experience;
- - taking part in fieldwork or an excursion;
- - carrying out experiments;
- - taking part in another educational activity aimed at acquiring certain skills;

f. interim examination: an examination testing the knowledge, understanding and skills of the candidate in relation to a certain unit of study as well as an assessment of the results of that test by at least one examiner designated by the Examining Board;

g. examination: a review of the student's academic achievements, in which the Examining Board assesses whether or not all interim examinations of the units of study that are part of the Master's programme have been successfully completed, insofar as the Examining Board has not determined that the examination also includes an examination by the Examining Board, testing the knowledge, understanding and skills of the candidate as well as an assessment of the results of that test (in accordance with Article 7.10 of the Act);

h. Examining Board: the examining board of the programme set up in accordance with Article 7.12 of the Act;

i. examiner: the person designated by the Examining Board in accordance with Article 7.12 of the Act who administers the interim examinations;



j. ec: credits in accordance with the European Credit Transfer System, 1 ec is equal to 28 hours of study;

k. working days: Monday to Friday, except statutory holidays;

l. Prospectus: the prospectus for one of the programmes as referred to in article 1.1 containing specific information about the Master's programme;

m. institution: Radboud University Nijmegen;

### Article 1.3 Aims of the programme

The aims of the programme are:

- a. Acquire knowledge, skills and insights in the field of Environmental Sciences;
- b. Development of academic competences;
- c. Research variant (R-variant), additional to a and b: preparations for Master research
- d. Management variant (MT-variant): Additional to a and b: Acquiring knowledge, skills and insights in the relevant fields of Management.
- e. Science communication variant (C-variant): Additional to a and b: Acquiring knowledge, skills and insights in the relevant fields of Science communication.
- f. Education variant (E-variant): additional to a and b: acquiring competencies as a teacher.

### Article 1.4 Type of programme

The programme is a full-time programme.

### Article 1.5 The examinations of the programme

Students who pass the final examination of the programme obtain the degree of Master of Science (MSc).

### Article 1.6 Study load

The study load of the programme is 120 ec, in accordance with the European Credit Transfer System, in terms of which 1 European Credit equals 28 hours of study.

### Article 1.7 Language

1. The programme is offered in the English language; the interim examinations and examinations are administered in the English language.
2. For programmes offered in English, the Radboud University Code of Conduct with regard to foreign languages applies.

3. To take part in the programme and the interim examinations of the components mentioned in Article 2.1.a, students need to have sufficient knowledge of the English language. This requirement is satisfied if the student:

- a. has a pre-university education diploma (VWO) ; or
- b. has a secondary education diploma, obtained at an English-language institution for secondary education in the Netherlands or elsewhere; or
- c. has a higher vocational education (HBO) diploma; or
- d. has a Dutch university Bachelor's degree; or
- e. has successfully completed one of the following tests:
  - TOEFL with a score of 550 or higher for the paper version;
  - TOEFL with a score of 213 or higher for the computer version;
  - TOEFL with a score of 79 or higher for the internet version;
  - the IELTS with a score of 6.5 or higher.

The examining board may, should the occasion arise, assess for itself whether the student sufficiently masters the English language.

## **SECTION 2 THE MASTER'S PROGRAMME**

### Article 2.1a Composition master's programme (O-variant)

The master's programme includes the following components with the corresponding study load:

#### 1. Compulsory courses:

- o Environmental Sciences (5 ECs)
- o Environmental & Ecological modelling (5 ECs)
- o Integrated Environmental Assessment (5 ECs)
- o Orientation in Environmental Research and Management (5 ECs)
- o Research skills (3 ECs)
- o Final assignment (4 ECs)
- o Intervention (3 ECs)

#### 2. Courses to choose:

- o Two environmental scientific research traineeships, to be determined subject to the approval of the examining board and equalling a minimum of 30 ECs, conducted under the supervision of a university professor of the faculty of Science or of the Faculty of Medical Sciences.

3. Free elective courses equalling a minimum of 27 ECs (academic level and testable; a minimum of 21 ECs should be on master level);

To that end, and subject to the approval of the examining board, the student can choose from the possibilities below or opt for a combination of these possibilities:

- 1. expanding an (external) environmental scientific research traineeship up to 45 ECs

2. a (profession-oriented) traineeship of 15 ECs
3. other examination components.

4. A course of a philosophical nature (3 ECs) with respect to which the student is to choose from:

- a. Evolution and Philosophy
- b. Science and Literature
- c. Global ethics and Sustainable Society
- d. Philosophy of Landscape and Nature
- e. Evolution and the Mind
- f. Bio-ethics for Life Scientists
- g. Philosophy of Water Management

#### Article 2.1b Differentiation Human and Environmental Risk Assessment (HERA)

The master's programme includes the following components with the corresponding study load:

##### 1. Compulsory courses:

- o Environmental Sciences (5 ECs)
- o Environmental & Ecological modelling (5 ECs)
- o Occupational Toxicology (6 ECs)
- o Orientation in Environmental Research and Management (5 EC)
- o Research skills (3 ECs)
- o Intervention (3 ECs)
- o Final assignment (4 EC)
- o Risk communication (3 EC)
- o Risk Management of Chemicals (3 EC)

##### 2. Courses to choose:

o Two environmental scientific research traineeships, to be determined subject to the approval of the examining board and equalling a minimum of 30 ECs, conducted under the supervision of a university professor of the Faculty of Science or of the Faculty of Medical Sciences.

3. Free elective courses equalling a minimum of 20 ECs (academic level and testable; a minimum of 14 ec should be on master level);

To that end, and subject to the approval of the examining board, the student can choose from the possibilities below or opt for a combination of these possibilities:

1. expanding an (external) environmental scientific research traineeship up to 45 ECs
2. a (profession-oriented) traineeship of 15 ECs
3. other examination components.

4. A course of a philosophical nature (3 ECs) with respect to which the student is to choose from:

- a. Evolution and Philosophy
- b. Science and Literature
- c. Global ethics and Sustainable Society
- d. Philosophy of Landscape and Nature
- e. Evolution and the Mind
- f. Bio-ethics for Life Scientists
- g. Philosophy of Water Management

Article 2.2 Composition master's programme (MT-variation)

1. Programme-specific components equalling a total of 54 ECs

A. Compulsory courses:

- o Environmental Sciences (5 ECs)
- o Environmental & Ecological Modelling (5 ECs)
- o Integrated Environmental Assessment (5 ECs)

B. Course to choose:

- o An environmental scientific research traineeship with a study load totalling 30 ECs, the responsibility of which lies with a university teacher of the faculty.

C. Free electives:

Courses equalling 9 ECs. The student, subject to the approval of the examining board, can choose from the various options below or for a combination of the options below:

1. Expanding an (external) environmental scientific research traineeship
2. a (profession-oriented) traineeship
3. other examination components on the master's level.

2. MT-components equalling a total of 57 ECs, consisting of:

A. Compulsory courses (basic subjects):

- Business & Society (5 ECs),
- Organization Theory (5 ECs),
- Innovation management (5 ECs),
- Strategy & Marketing (5 ECs),
- Finance and Accounting (5 ECs).

B. MT-electives (5 EC's) can be chosen in:

- Project Management (3 ECs)
- Science and entrepreneurship (3 ECs)
- Research Strategy and Management (3 ec)
- Courses in mutual agreement with the coordinator responsible

C. MT Masterthesis (27 ECs)

3. Free electives equalling a minimum of 6 ECs (provided on an academic level and testable);
4. A course of a philosophical nature (3 ECs) with respect to which the student is to choose from:
  - a. Evolution and Philosophy
  - b. Science and Literature
  - c. Global ethics and Sustainable Society
  - d. Philosophy of Landscape and Nature
  - e. Evolution and the Mind
  - f. Bio-ethics for Life Scientists
  - g. Philosophy of Water Management

#### Article 2.3 Composition master's programme (C-variation)

The master's programme C-variation includes the following components with the corresponding study load:

1. Programme-specific components equalling a total of 54 ECs:

##### A. Compulsory courses:

- o Environmental Sciences (5 ECs)
- o Environmental & Ecological Modelling (5 ECs)
- o Integrated Environmental Assessment (5 ECs).

##### B. Course to choose:

- o An environmental scientific research traineeship equalling 30 ECs, the responsibility of which lies with a university teacher of the faculty.

##### C. Free electives:

Courses equalling 9 ECs. Subject to the approval of the examining board, the student can choose from the possibilities below or opt for a combination of these possibilities:

1. Expanding an (external) environmental scientific traineeship up to 45 ECs
2. a (profession-oriented) traineeship of 15 ECs
3. other examination components on the master's level.

2. C-components equalling a total study load of 57 ECs:

##### A. Compulsory courses in the first year:

- Introduction Science Communication (3 ECs)
- Science and Societal Interaction (3 ECs)
- Risk Communication (3 ECs)
- Boundary Work (3 ECs)

##### B. Compulsory courses in the second year:

- Framing Knowledge (3 ECs)
- Knowledge Society (3 ECs)
- Science, Media and Strategy (3 ECs)

C. C-Optional courses, subject to the approval of the teacher responsible for the variation, equalling a total of 6 ECs.

D. Traineeship and reporting (30 ECs).

3. Free Electives equalling a minimum of 6 ECs (academic level and testable);

4. A course of a philosophical nature (3 ECs) with respect to which the student is to choose from:

- a. Evolution and Philosophy
- b. Science and Literature
- c. Global ethics and Sustainable Society
- d. Philosophy of Landscape and Nature
- e. Evolution and the Mind
- f. Bio-ethics for Life Scientists
- g. Philosophy of water Management

#### Article 2.4 Composition master's programme (E-variation)

The master's programme E-variation includes the following components with the corresponding study load:

1. Programme-specific components equalling a total of 54 ECs:

A. Compulsory courses:

- o Environmental Sciences (5 ECs)
- o Environmental & Ecological Modelling (5 ECs)
- o Integrated Environmental Assessment (5 ECs)

B. Free course:

- o An environmental scientific research traineeship equalling 30 ECs, the responsibility of which lies with a university teacher of the faculty.

C. Free electives;

Courses equalling 9 ECs. Subject to the approval of the examining board, the student can choose from the possibilities below or opt for a combination of these possibilities:

1. Expanding an (external) environmental scientific traineeship up to 45 ECs
2. a (profession-oriented) traineeship of 15 ECs
3. other examination components on the master's level.

2. E-components equalling a total study load of 57 ECs:

Two traineeship periods totalling 57 ECs. These traineeship periods are integrated learning projects involving a continuous interaction between theory, practice, intervision and supervision.

3. Free elective courses equalling a minimum of 6 ECs (academic level and testable);

4. A course of a philosophical nature (3 ECs) with respect to which the student must choose from:

- a. Evolution and Philosophy
- b. Science and Literature
- c. Global ethics and Sustainable Society
- d. Philosophy of Water Management
- e. Philosophy of Landscape and Nature
- f. Evolution and the Mind
- g. Bio-ethics for Life Scientists

#### Article 2.5 Differentiation Transnational ecosystem based Water Management

The following components apply to the main subject Transnational ecosystem based Water Management:

1. Compulsory courses:

- o Orientation in Environmental Research and Management (5 ECs)
- o Environmental Sciences (5 ECs)
- o Integrated Water Management (4 ECs)
- o Integrated Environmental Assessment (5 ECs)
- o Environmental Economics for Water Management (4 ECs)
- o People and Water (4 ECs)
- o Waterborn Diseases (2 ECs)
- o Hydrogeology and Application (4 ECs)
- o Hydraulics and Sediment Transport (3 ECs)
- o Ecology and Protection of Freshwater Ecosystems and Aquatic Organisms (5 ECs)
- o Hydrobiological Field Trips (2 ECs)
- o Water Pollution (2 ECs)
- o Basics in Hydraulic Planning and Facility Design (3 ECs)
- o Waste Water Treatment (2 ECs)
- o Flood Management (2 ECs)
- o River Basin Management (3 ECs)
- o Hydroclimatology and Sustainable Water Management (2 ECs)

2. Free components

- o Project of 16 ECs
- o Master's thesis of 30 ECs

3. Free elective courses equalling a minimum of 14 EC (academic level and testable; a minimum of 8 ECs should be on master level);

4. A course of a philosophical nature (3 ECs) with respect to which the student must choose from:

- a. Evolution and Philosophy
- b. Science and Literature
- c. Global ethics and sustainable society
- d. Philosophy of water management

- e. Philosophy of Landscape and nature
- f. Evolution and the mind
- g. Bio-ethics for Life scientists

#### Article 2.6 Approval of the master's programme

The list of courses is to be approved in advance by the Examining Board.

#### Article 2.7 Free master's programme

The student is free to compile an education programme at his/her own discretion (as established in article 7.3.4 of the WHW). This programme is subject to the approval of the examining board.

### **SECTION 3 PRELIMINARY EXAMINATIONS AND EXAMINATIONS**

#### Article 3.1 Sequence of the interim examinations

1. The interim examinations of the following components can only be taken after the interim examinations of the components mentioned below have been completed successfully:

- The Master's thesis project after completion of all the compulsory courses.

- *MT variant*: Innovation Management and Strategy Marketing after completion of Business & Society and Organizations Theory.

- *MT variant*: The final master project of the MT variant after completion of at least 45 ec of the total study load including the practical activities of the research traineeship and at least 3 courses of the 5 basic MT courses as mentioned in article 2.2.

- *C Variant*: The traineeship of the C variant after completion of at least 45 ec of the total study load including the practical activities of the research traineeship and the majority of the basic courses of the C variant as mentioned in article 2.3.

- *E Variant*: The traineeships of the E variant after completion of at least 45 ec of the total study load including the practical activities of the research traineeship.

- *TWM Variant*. The project and traineeship of the TWM-differentiation cannot be conducted until the student has acquired a satisfactory mark for and/or has been exempted from components of the master's education programme ES differentiation TWM equalling a study load of at least 45 ECs.

2. In certain cases, the Examining Board may determine another sequence.

#### Article 3.2 Time schedule and frequency of the interim examinations



1. A student will be given the opportunity to participate in the interim examinations regarding the components as referred to in articles 2.1 through 2.5 at least twice a year, with the exception of practical work or the practical part of components, as these are administered only once per academic year. Interim examinations are administered immediately following the course concerned, as well as during a period to be determined later but preferably immediately prior to the beginning of the subsequent academic year. The Participation limitation regulation applies here (see the appendix).

2. Contrary to the provisions in Article 3.2.1 students are given only 1 opportunity a year to take an interim examination of a component if education in that component has not been offered in a particular year.

#### Article 3.3 Form of the interim examinations

1. The examination components of the courses as referred to in article 2 can be completed as follows:

- a. In writing and/or
- b. Practical assignments + report and/or
- c. Computer exercises and/or
- d. Computer interim examination and/or
- e. Oral presentation.

2. The examining board may allow the student, at his/her request, to participate in an interim examination in a manner other than aforementioned.

3. Students with a functional disorder will be given the opportunity to participate in interim examinations in a fashion that is adjusted as much as possible to their individual handicap. If necessary, the examining board may opt to obtain expert advice prior to making its decision. Should the students concerned require certain facilities during an examination, then they are to request this of the teacher concerned not later than two weeks prior to the interim examination.

#### Article 3.4 Oral interim examinations

1. Oral interim examinations will be conducted one student at a time, unless the examining board decides otherwise.

2. Oral interim examinations are not public, unless the examining board or the examiner concerned has decided otherwise, and/or if the student objects to this.

#### Article 3.5 Assessment and notification of results of interim examinations

1. The examiner is to determine the result of the oral interim examination immediately afterwards and will provide the student with a written confirmation of the result of the examination.

2. The examiner will determine the result of a written interim examination within 30 days of the day on which it was written or at least 10 days before the next occasion to take the interim examination, and will provide the Centre of Educational Services of the faculty with the necessary information for issuing written proof of the results to the student.
3. For every interim examination that is not oral or written the Examining Board determines in advance in what way and at what time the student will receive a written proof of the result.
4. The interim examination outcome statement informs students that they have a right of inspection, as referred to in Article 3.7.1, and also that they may appeal to the Examination Appeals Board.
5. The period in which students can appeal a decision by the Examining Board to the Examination Appeals Board is four weeks.

#### Article 3.6 Period of validity

- 1. The period of validity of courses completed in the programme is unlimited.
- 2. Contrary to the provision of Article 3.6.1, the Examining Board may introduce additional requirements if the content of certain courses has changed drastically since the interim examinations were taken.

#### Article 3.7 Right of inspection

1. The student, at his/her request, is allowed the right of inspection of his/her assessed work for a period of at least six weeks after having been informed of the result of a written interim examination. In addition, the student can obtain a copy of his/her work upon request and at the cost price.
2. During the period referred to in the previous paragraph, any interested party will be allowed access to the questions and assignments of the interim examination, and if possible, to the standards used in the assessment.
3. The Examining Board may determine that the inspection or taking cognizance shall take place at a designated place and at a minimum of two fixed points in time. If the person in question can prove that he or she cannot attend or has not been able to attend due to force majeure at the time and place thus determined, he or she will be given another opportunity to do so, if possible within the time period mentioned in Article 3.7.1.

#### Article 3.8 Exemption

1. At the request of the student and after having consulted the examiner concerned, the examining board may allow the student exemption from a interim examination, if the student:
  - a. has completed components of a university of higher vocational education (HBO) that correspond to the examination concerned in terms of content and level;
  - b. can prove that he/she has sufficient knowledge and skills regarding the component

concerned due to work experience and/or professional experience.

#### Article 3.9 Final examination

1. As soon as the student has submitted sufficient proof of having passed the required interim examinations he/she is allowed to register for the Master's examination.
2. The Examining Board will determine the result of the final examination and will determine the regulations concerning the standards used in the assessment.
3. Prior to determining the result of the final examination, the Examining Board can evaluate and assess the knowledge of the student concerning one or more components of the programme if this is motivated by the results.

#### Article 3.10 Degree

1. The student who successfully completes the master's examination will be granted the degree of "Master of Science". (MSc)
2. The degree will be stated on the certificate of the examination.
3. The student who successfully completes the O-variation as referred to in article 2.1 will receive the supplementary differentiation Research in addition to the master's degree.
4. The student who successfully completes the MT-variation as referred to in article 2.2 will receive the supplementary differentiation Management & Application in addition to the master's degree.
5. The student who successfully completes the C-variation as referred to in article 2.3 will receive the supplementary differentiation Communication of Science in addition to the master's degree.
6. The student who successfully completes the E-variation as referred to in article 2.4 will receive the supplementary differentiation Education in addition to the master's degree and will be granted a comprehensive teaching qualification by the Institute for Teacher and School.
7. The student who successfully completes the TWM-variation as referred to in article 2.5 will receive the supplementary differentiation Transnational Ecosystem based Water Management in addition to the master's degree.
8. The student who successfully completes the HERA-differentiation as referred to in article 2.1b will receive the supplementary research differentiation Human and Environmental Risk Assessment in addition to the master's degree.

### **Section 4 Prior education**

#### Article 4.1 Admission requirements for the master's programme

1. Without prejudice to that stated in article 4.3, the following persons will be admitted to the programme:
  - a. Those who have passed the final examination of the bachelor's programme Environmental Sciences, or Biology with a minor in Environmental Sciences, at the RU Nijmegen;
  - b. those who possess a Proof of Admission from the Executive Board for the present year.

c. Those in possession of a bachelor's degree pertaining to some other education programme or with some other minor (university or higher vocational level), provided that, in the opinion of the examining board, any existing deficient can be fulfilled by means of a transition programme in the equivalent of a maximum of 30 ECs and the transition programme that has been arranged for that purpose is indeed successfully completed.

#### Article 4.2 Proof of admission

The following persons are eligible to receive proof of admission:

- a. Those in possession of a certificate that at least equals the certificate as specified in article 4.1 under a (and/or b),
- b. Those who, in the opinion of the examining board, have demonstrated in some other way to be suitable to participate in the programme, and
- c. who have proved to have sufficient knowledge of the English language as stated in article 1.7.

#### Article 4.3 Flexible entrance in the master's programme

1. The examining board may, insofar as the available student capacity allows, decide that a student who is registered for the bachelor's programme Environmental Sciences, or Biology with a minor in Environmental Sciences, at the RU can be admitted to the master's programme Environmental Sciences before the student concerned has successfully completed the final examination of the bachelor's programme Environmental Sciences, or the bachelor's programme Biology with a minor in Environmental Sciences.

2. The following admission criteria for flexible entrance apply:

- a. the student must have completed a course load of at least 162 ec of the bachelor programme;
- b. contrary to the provision of Article 4.3 sub 2, a completion of a course load of 150 ec is sufficient for students who started their Bachelor's programme on 1 Sept., 2002.
- c. A satisfactory mark has been obtained for all of the components of the first year (60 ECs) and the bachelor thesis.

3. The student who is admitted by virtue of this article is required to complete the final examination of the bachelor's programme as referred to in the first paragraph not later than one year after being admitted. If not, the student is excluded from interim examinations in the Master's programme until the Bachelor's degree has been obtained.

### **Section 5 Student counselling**

#### Article 5.1 Monitoring of students' progress

1. The faculty records the individual study results of the students.
2. The faculty will provide each student with an overview of the study results at least once a year.

## Article 5.2 Student counselling

The faculty is responsible for offering guidance to students in introducing them to university life, as well as counselling the students enrolled in the programme, also for the purpose of acquainting them with the study possibilities within and outside the programme.

## Section 6 Transitional and final provisions

### Article 6.1 Adoption of these regulations and any amendments

(Note: the reader is also referred to the Structure regulation articles 11 and 18 and Regulation UGV and FGV article 3.3.1.)

1. These regulations and any amendments to these regulations will be enacted by a separate order of the Dean, after consultation with the Education Committee and after having acquired the approval of the Joint Student-Staff Council.
2. Amendment to these regulations will not affect the current academic year, unless by doing so the interests of the students are not adversely affected in any way.
3. Any amendment to these regulations may not disadvantage students by affecting any other decision that, in accordance with these regulations, has been taken by the Examining Board on behalf of students.

### Article 6.2 Publication

1. The Dean is to ensure that these regulations, as well as the rules and guidelines as established by the examining board, as well as any amendments to these documents, are properly made public to those concerned.
2. Any interested party can obtain a copy of the documents referred to in Article 6.1.1. at the Faculty Office.

### Article 6.3 Priority of the Dutch version

In the event of incongruity between the Dutch original and the English translation, the Dutch text will prevail.

### Article 6.4 Effective date

These regulations will become effective as of August 31, 2009.  
Confirmed by the Dean, July 1, 2009.

## Appendix

***Code of Conduct with regard to foreign languages as covered in article 7.2 section c WHW,***

The following Code of Conduct applies at Radboud University Nijmegen:

#### Article 1

Education and examinations may take place in another language than Dutch at the Radboud University Nijmegen if this is motivated by the specific nature of the program, the goal of maintaining the quality of the education, or the origin of the student.

#### Article 2

A decision to use a language other than Dutch is made by the Dean of the involved faculty, based on the education committee's advice. The Dean will consider the following aspects:

- A clear need for using a language other than Dutch must be established.
- Interim and final examinations can be given in Dutch at the request of the student. In an English language programme, examinations will be held in English unless the examination committee of the program decides otherwise.
- Use of a language besides Dutch may not lead to an increase in the workload of the program.
- This foreign language education must meet the same quality criteria as if the programme were in Dutch.

#### Article 3

The decision of the Dean must be included in the Education and Examination Regulations of the programme.

#### Article 4

On an annual basis the faculty Dean will report to the Executive Board of the university on decisions taken with respect to the programme.

#### ***Education Committee***

An education committee is required on the basis of art. 9.18 WHW. The committee has the following mandate:

- a. to give advice on the Education and Examination Regulations,
- b. to evaluate annually the performance of the education and examination aspects of the programme, and
- c. to give advice, solicited or unsolicited, to the director of education and the Dean on all aspects of the Master's degree programme in Environmental Sciences.

**Rules limiting eligibility for interim examinations.**

This rule of eligibility applies to all interim examinations given within the Faculty, as established by the Faculty decision taken on January 7, 2004.

- Students are given a maximum of three possibilities to pass a given interim examination. Registration via the KISS system is required, no later than 5 working days before the examination. Registration must be confirmed before the student is allowed to take the exam.

Any student that decides not to take the exam is required to cancel:

- via the KISS system: up to 5 working days before the exam.
  - directly via the lecturer: by written or electronic means up to 1 day before the exam.
- If the cancellation does not meet these requirements then the missed exam will count as one of the three possibilities.

- If after three attempts the student has still not passed the examination, any further request by the student to take the exam must be submitted in written form to the examination committee.
- The student administration is responsible for keeping track of the number of times a student has taken an examination.
- This rule applies to both oral and written examinations.
- This rule applies to all students of the Faculty of Science.
- If the student can demonstrate that he/she was unable to cancel participation in an examination due to circumstances beyond his or her control, the examination committee can decide not to count the examination as an official attempt.
- This rule applies to students registering for their first attempt to participate in an examination, starting February 1, 2004.

**Other regulations regarding examinations (as stipulated in article 7.12 section 4 WHW).**

The Examining committee will set the rules with the goal of ensuring fair and valid examinations. This may include cases where a student is found to be committing fraud while taking the exam. In this case the examination committee may ban the student for a period of up to a year from participating in the given examination or from participating in any other examinations, as decided by the committee.

**7.5 Admission criteria and rules for the MSc programme ES****1. Admission criteria**

The table beneath gives an overview of the admission criteria and rules for the MSc programme ES.

<b>Pre-qualifications</b>	<b>Decision by Board of Examiners</b>	<b>Remarks</b>
<ul style="list-style-type: none"> <li>• Applicants with a Bachelor's degree in</li> </ul>	-	<ul style="list-style-type: none"> <li>• Direct access.</li> </ul>

Biology with minor Environmental Sciences at Radboud University Nijmegen, or a Bachelor's or Master's degree in Water Sciences at the University Duisburg-Essen.

- Applicants with a University degree, e.g. BSc, MSc, (integrated) Env. Sciences in Natural Sciences
- Applicants with a University degree, e.g. BSc, MSc, University Diploma (*Universitätsdiplom*), State Examination (*Staatsexamen*) with a minor Env. Sciences (or Equivalent) in Biology, Chemistry, Ecology, Earth Sciences, Water Sciences.
- Applicants with a University degree, e.g. BSc, MSc, University Diploma (*Universitätsdiplom*), State Examination (*Staatsexamen*) in Natural Sciences, Geology, (Physical) Geography, Hydrology, Physics, Water Sciences, Water and Land Management, Medical Biology, Biomedical Sciences and Molecular Life Science. x
- Applicants with a BSc form a University of professional Education with a minor Env. Sciences in Aquatic Ecotechnology, Land- en Watermanagement.
- Direct access if applicants meet the requirement that the degree is graded with at least a 7.0 according to the Dutch grading system / a 2.2 (C) according to the international grading system.
- In the other cases, deficiency courses may be imposed to follow in the free space of the master programme and to fulfil the high quality standards. The deficiency courses with a maximum of 15 ec are composed by the Examination Board on a case-by-case basis, depending on the qualification<sup>1)</sup> and motivation of the candidate<sup>2)</sup>.



- Applicants with a BSc, MSc, Diploma or equivalent degree from a University of Professional Education (e.g., Polytechnic, HBO, *Fachhochschule*) in one of the above mentioned study programs. x
- Direct access if applicants meet the requirement that the degree is graded with at least a 7.5 according to the Dutch grading system / a 2.8 (C) according to the international grading system.
- In the other cases, deficiency courses may be imposed to fulfil the high quality standards. The deficiency courses with a maximum of 30 ec are composed by the Examination Board on a case-by-case basis, depending on the qualifications<sup>1)</sup> and motivation of the candidate<sup>2)</sup> and should be finished before starting the master programme.
- Applicants may issue an admission request indicating their qualifications<sup>1)</sup> and motivation. The request will be assessed by the Examination Board on a case-by-case basis.
- Deficiency courses may be imposed to fulfil the high quality standards. The deficiency courses are composed by the Examination Board on a case-by-case basis, depending on the qualifications<sup>1)</sup> and motivation of the candidate<sup>2)</sup>.
- Applicants with a University degree or a degree from a University of Professional Education in Civil Engineering or Technical Sciences. x
- Applicants who do not meet the formal requirements outlined above.

<sup>1)</sup> The following criteria will be applied: curriculum, grades and professional experience.

<sup>2)</sup> Candidates having deficiencies of an amount more than 30 credits will not be admitted.

Applicants must provide the signed admission form together with the following documents:

- applicant's choice of study
- a Curriculum Vitae
- legally certified copies of university and pre-university certificates (diplomas and transcripts)
- legally certified translations of university and pre-university certificates (diplomas and transcripts) by an officially recognized translator if the certificates are not in English, Dutch or German
- a copy of passport
- a letter of motivation
- a proof of proficiency in English (e.g., TOEFL, IELTS, Cambridge EFL examinations) (for more information see 'Language requirements')

## 2. Language requirements

### English as a condition for admission to the Master programme ES

In order to participate in the English-language study programme and in the preliminary examinations, it is essential that the student has a sufficient knowledge of the English language. The student will be considered to meet this requirement if:

- 1. His/her first language is English. Student is considered to be a native speaker of English if he/she is from Australia, Canada, Ireland, New Zealand, Singapore, UK, USA or South Africa; or
- 2. He/she has completed three years of study at a Dutch or German university and obtained a University degree, e.g. BSc, MSc, University Diploma (*Universitätsdiplom*), State Examination (*Staatsexamen*); or
- 3. He/she gained all qualifications required for the study programme in the English language at an University or University of Professional Education (e.g., Bachelor study at an University of Professional Education was taught in English) in a EU country or in Australia, Canada, Ireland, New Zealand, Singapore, UK, USA, South Africa; or
- 4. He/she has obtained a secondary education diploma at an English-language institution for secondary education either within a EU country or within Australia, Canada, Ireland, New Zealand, Singapore, UK, USA, South Africa; or
- 5. He/she has successfully completed one of the following tests:
  - \* the IELTS with a score of 6.5 or higher;
  - \* the TOEFL with a score of 550 or higher for the paper version;
  - \* the TOEFL with a score of 213 or higher for the computer version;
  - \* the Internet-based version of the TOEFL (TOEFL iBT) with a score of 79 or higher;
  - \* the Cambridge Certificate in Advanced English with a minimum grade C;
  - \* the Cambridge Certificate of Proficiency in English with a minimum grade C.

These applicants are considered to be proficient in English and do not need to provide an English language test score. All other applicants, including applicants who hold a degree of a non-English taught study programme at an University of Professional Education (e.g., HBO, FH) must provide proof of proficiency in English. To do so, the applicant is required to take one of the following English language tests either in your own country or in the Netherlands:

### IELTS (International English Language Testing System)

This test, administered by the British Council and the University of Cambridge, is the test

preferred by Radboud University Nijmegen. Applicants must achieve an overall minimum test score of 6.5. For information about test dates and centres in your home country, please visit [www.ielts.org](http://www.ielts.org). In the Netherlands, you may contact the British Language Training Centre in Amsterdam (tel: +31 20 622 36 34).

### **TOEFL (Test of English as a Foreign Language)**

This American test of English is administered by the Educational Testing Service USA. Applicants must achieve a minimum test score of 550 for the paper test or 213 for the computer test.

For information about test dates and centres in your home country, please visit [www.toefl.org](http://www.toefl.org) and request an information bulletin.

If you want to make an appointment for a TOEFL test (in the Netherlands), please contact Prometric in Lelystad, tel: +31 320 23 95 40. For information on exams, study materials and an information bulletin, please contact CITO in Arnhem, tel: +31 26 352 14 80.

In September 2005 the Internet-based version of the TOEFL test (TOEFL iBT) was introduced. For this internet based test, the minimum test score an applicant must achieve is 79.

For students from **Indonesia**: Radboud University does not accept TOEFL scores from other institutions except those from the TOEFL administered at the Netherlands Education Centre (NEC) in Jakarta. For information about the NEC, please visit <http://www.nec.or.id/home.php>.

The TOEFL Institutional Code Confirmation for Radboud University Nijmegen is **3387**. With this number TOEFL will send your testresults directly to Radboud University Nijmegen.

### **Cambridge EFL examinations**

Applicants with a Cambridge Certificate in Advanced English must have obtained the minimum pass grade C. Applicants with the Cambridge Certificate of Proficiency in English must have obtained at least a C grade.

Radboud University does not accept a First Certificate in English.

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