

Faculty of Science

Prospectus 2008 - 2009

Information Science

Master

Radboud University Nijmegen

Preface

This is the prospectus for the 2008 master programme of Information Science of the Radboud University, Nijmegen. This prospectus contains information about the contents of the programme and courses. Furthermore a lot of practical information is given.

This prospectus has been made with care. Nevertheless, it is possible that it contains some inaccuracies and the authors cannot be held responsible for those. No rights can be derived from the information in this prospectus.

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Contents

1	Introduction.....	1
1.1	Welcome.....	1
1.2	Organisation and practical matters.....	2
1.3	Administrative details: exams.....	3
1.4	Internet services.....	4
1.5	Vademecum and the Statutes for Students at the Radboud University Nijmegen.....	5
1.6	Finding a job.....	5
2	Master programme Information Sciences.....	6
2.1	The master programme: introduction.....	6
2.2	Overview of courses.....	7
2.3	Transition programme for post-Polytechnic bachelors ("HBO-doorstromers").....	8
2.4	Extra-curricular possibilities.....	9
3	Course Descriptions.....	11
3.1	Courses of the master programme.....	11
3.2	Course suggestions for specialisation or free choice.....	25
3.3	Courses of the transition programme (schakelprogramma).....	35
4	Appendices.....	51
4.1	Calendar 2008-2009.....	51
4.2	Important names and addresses.....	52
4.3	Procedure for "Schakelverklaringen".....	54
4.4	List of lecturers.....	55
	Index of courses.....	56

1 Introduction

1.1 Welcome

Welcome to the Institute for Computing and Information Sciences. The institute is part of the Faculty of Science of the Radboud University Nijmegen, and is responsible for the academic programmes in Computing and Information Sciences. At our institute you can follow a Bachelor programme (3 years) and/or a Master programme (1 year for Information Science; 2 years for Computing Science). The Radboud University Nijmegen is a general university, offering almost all possible academic programmes, ranging from Arts and Law, to Medicine and Science. The Master programmes allow a substantial choice of topics from different areas, thereby offering the possibility of combinations of different studies.

The one-year Master of Science programme in Information Science constitutes the follow-up to the Bachelor programme of Information Science, and focuses in more detail on Business Intelligence, Predictive Modeling and Digital Security. A two-year master programme is currently in preparation. When foreign students are participating, the master programme is taught in English (in the case of Dutch students only, courses may be taught in Dutch).

Credit point system

The Radboud University uses the European Credit Transfer System (ec) employed by all universities in the European Union. One year is 60 ec, therefore the Master programme of Information Science comprises 60 ec.

Admission

The master programme of Information Science requires a Bachelors degree in Information Science from the Radboud University, or an equivalent degree. Also students with an post Polytechnic-degree (Dutch: HBO-diploma) can be qualified, although they are always obliged to do an extra, individual transition programme ("schakelprogramma") of at least 30 ec before entering the master programme as a master student. These students start as bachelor students until they finish their transition programme. A special intake procedure has been set up for this group of students. Since the transition programme consists of courses from the Bachelor programma, it is usually taught in Dutch. See chapter 2 for more details on the special programme for post-Polytechnic bachelor students.

Enrollment

The Central Student Administration takes care of all student enrollments at Radboud University Nijmegen. If you are already a student at the Radboud University, re-enrollment is done via Internet. In the months prior to re-enrollment, you will receive further information on this. In order to obtain your student and registration cards on time, you are requested to arrange your re-enrollment immediately after 1 June. You will receive your student card and registration card on average six weeks after your enrollment has been processed. Further information on enrollment can be found in the Student Statute and on the site www.ru.nl/studenten. If you are graduating, you arrange your de-registration with the University Certification Bureau. For any questions about enrollment, please go to the Central Student Desk.

In the remainder of this chapter you will find some practical information and an overview of important dates, names and addresses. More information can be found at www.ru.nl/iii.

1.2 Organisation and practical matters

Education Office

All practical matters regarding the planning of courses and exams as well as various administrative matters regarding students are taken care of by the Education Office. The staff Members of the education office are listed further on in this chapter (see "Important names and addresses"). The coordinator of studies for Information Sciences is Vera Kamphuis, V.Kamphuis@cs.ru.nl and the coordinator of studies for Computing Science is Yella Kleijnen, Y.Kleijnen@cs.ru.nl.

The secretary's office of the Education Office can be found in the Huygens building, room HG02.540. General phone number is 024-365 20 84.

Course programmes and courses

In addition to the information provided in chapter 2, you may find a lot of information about course programmes and courses on the webpages of our institute. The main link for this is www.ru.nl/iii where subpages with practical information can be found.

Timetable and course information

When and where a course or an examination is planned can be found through our time table viewer on www.ru.nl/iii/onderwijs/rooster (English explanation can be found on www.ru.nl/iii/onderwijs/english_pages/time_table_generator). With this timetable viewer you are able to compose your personal weekly timetable for your individual combination of courses. Indicate the courses that you want to attend and you will be able to view your personal timetable for the actual week with a single mouse click.

Communication

A lot of communication in our institute is done electronically. Lecturers use Blackboard, e-mail or wiki in their courses. Also, the Education Office uses Blackboard and e-mail for important announcements regarding timetables or exams. When you enroll as a student in one of our programmes, you will be added to the Blackboard community for students of our institute. For this, we will use your official RU-e-mail address.

It is your responsibility to make sure that this address always remains intact!

If you're not enrolled in time (meaning, not before 15 September) it is possible that your name is not on the list of so called "active" students. We are not able to enroll "not active" students, and therefore you have to enroll yourself for the Blackboard community *NIII-onderwijs*.

Important names and addresses

Important names and addresses of various people and committees in our institute can be found in the appendix (chapter 4.2).

Among others, you will find there the contact details of

- the **master advisor**, Dr. Theo Schouten (T.Schouten@cs.ru.nl)
- the **advisor for HBO-students**, Dr. Hanno Wupper (H.Wupper@cs.ru.nl) and
- the **master thesis coordinator**, Dr. Patrick van Bommel (pvb@cs.ru.nl)

1.3 Administrative details: exams

Registration for courses and course exams

If you want to take part in a course or an exam, you must register yourself by means of the student internet service system KISS/TIS. More information on this can be found below.

For courses provided by the institute of Computing and Information Sciences (starting with the course code I), a registration for the course is automatically also transferred to a registration for the first course exam. Nevertheless you should always check in time whether you have been registered for the exam. If you have not been registered, your grade cannot be administered and you will have to take part in the next examination opportunity. For the next opportunity you have to register yourself via KISS/TIS.

The Master examination

When you have completed all courses of the programme, you qualify for the Master Examination. You have to apply for this examination at the Student Administration / Examination Office of the Faculty (FSA).

To register for this examination, students must submit the following documents:

- valid student card (two cards: registration card **plus** student card. The one is not valid without the other)
- only for students who obtained their bachelor certificate elsewhere: bachelor certificate (or kandidaats certificate)
- only for students who obtained their bachelor certificate elsewhere: an extract from the population register or register of persons, or a copy of the birth certificate
- Only for students who were registered as external students during part of their study: a confirmation of external student status. This is a statement from the institute confirming that the student in question did not receive any education during the period that he/she was registered as an external student.

The Student Administration/Examination Office will only register students for the Master's examination if *all the results* of the interim examinations are in the possession of and have been processed by the Student Administration/Examination Office. You need to check this yourself. If you register for your examination and not all the results have been processed, you will fail your examination.

The regulations governing the examinations in August are somewhat different. For these, students can register up to May 29 (last Friday in May), 2009, and may do so even if several marks have not yet been obtained. These marks have to be delivered before August 28 (last Friday of August), 2009.

There are 11 examinations dates scheduled each year (usually the last Friday of the month, provided this is not an official holiday; in July there is no examination date at all). Please check the planning schedule on the notice boards at the FSA. Students should register for the examinations no later than the closing date. The diplomas are presented once every three months. If students need proof of graduation before the date of presentation (e.g. when applying for a job), they can obtain written proof of graduation from the Examination Board.

Rules and Regulations concerning the Master programme

The examination regulations have been laid down in two documents. The Education and Examination Regulations (OER) govern the general organization and scope of education and examinations. More specific regulations can be found in the Rules and Regulations of the Examination Committee.

The full text of the OER can be found at www.cs.ru.nl/examencommissie/index.html. The official document is in Dutch, but for the convenience of foreign students a translation is provided (same site).

Examination Board and Examination Appeals Board

With regard to examination-related matters, students may first contact the Examination board of the Institute for Computing and Information Sciences (contact details can be found further on in this chapter). In the case of conflict, students can appeal to the Examination Appeals Board of the Radboud University Nijmegen. The procedure to be followed is described in the Vademeicum for Students, which can be obtained from the Bureau of Registration of the Radboud University.

1.4 Internet services

KISS

The Radboud University Nijmegen offers all students free access to the Internet and free web mail. Through KISS, students can enroll for courses, sign up for exams, and check their exam results by computer. Every student receives up to 100 MB of free disk space for his or her own website. These 'KISS Services' will remain available for at least 6 months after the student has left the Radboud University Nijmegen.

Please note that the KISS password does not give you access to the computers available on campus. For this, the faculty will supply you with a separate pass word.

Opening hours KISS helpdesk

Mondays-Fridays: 10 A.M.-5 P.M.
(closed on the first Friday afternoon of each month)

Blackboard

The KISS password you receive will also give you access to the Radboud University digital learning environment system *Blackboard*. Lecturers use Blackboard to supply information about their course, send announcements etc. Blackboard is also used by the Education office of the Institute for Computing and Information Sciences to communicate important information (on matters regarding education) to students. Upon registering as a student, you will be enrolled in our community of ICIS-students with your official RU-e-mail address. *Please make sure that this remains intact always.*

1.5 Vademeicum and the Statutes for Students at the Radboud University Nijmegen

The Vademeicum for students studying at the Radboud University Nijmegen contains general information concerning housing, health care, government funding, studying, students' rights and responsibilities, services, and student associations and organizations. You will also find useful addresses and telephone numbers in this brochure. The information in the Vademeicum is also on the Internet: www.ru.nl/studentenzaken.

The student statutes consist of a description of the rights and responsibilities of all students registered at the Radboud University Nijmegen, based on statutory and university regulations. The student statutes and its appendices are on the Internet: www.ru.nl/studentenzaken. The Vademeicum is available free of charge at the Student Affairs Desk, all Lecture Note Centers and the Advice Office for the Faculty of Arts.

1.6 Finding a job

BBB

Job prospects for students of Computing or Information Science are excellent; many students already find a job before they graduate. Companies are keen to employ students with an academic career in IT-related disciplines. Every year the 'BBB' ("Bèta Bedrijven Beurs") organizes a job-market where companies present themselves to students. This annual career-event helps undergraduate and graduate students scout the job-market.

The BBB-event takes place in Spring semester at the Science Faculty: the next event will be on **May 28, 2009**. A great number of companies, organizations as well as follow-up degree programmes present themselves. Companies are present with a display and give lectures. You can gather information and talk with recruiters. Senior and PhD students can apply on-line around the time of the exhibition and stand a chance to be invited by one or more of the companies for an interview. These interviews are organized by BBB a few weeks after the exhibition. The chances to be invited at that moment are much higher as compared to when you send an open application to a company.

The exhibition is renowned for its casual atmosphere and for its service to visitors. Admission is free, no registering is needed and everybody receives the BBB-career guide.

Prior to the exhibition, BBB organizes workshops on a variety of topics that are relevant for job-seekers and career-starters, such as: interview training, case studies, but also more light-hearted topics.

Contact address: Heyendaalseweg 135, HG00.154, 024-3652388, www.bbb.science.ru.nl, e-mail: bbb@science.ru.nl

Student counseling facilities

To provide additional assistance in applying for jobs, the central Students Affairs Office at Comeniuslaan 4-6 also offers courses in presentation and has various facilities for job-orientation. More information can be found at their website, www.ru.nl/studenten/na_je_studie/informatiecentrum (website in Dutch).

2 Master programme Information Sciences

2.1 The master programme: introduction

All of the faculties of the Radboud University have implemented the bachelor-master structure. As the same structure has been implemented in most European countries, it is much easier to compare the university training programmes and it is easier to switch between universities. The academic programmes are made up of two components:

- Bachelor programme
- Master programme

The bachelor takes 3 years, the first of which (*propedeuse*) concerns foundation courses. The courses of the bachelor programme are generally taught in Dutch. The programme is broadly based and it prepares you for the master programme. After completing this programme you will receive the bachelor's degree, at which time you may call yourself *Bachelor of Science (BSc)*.

The master programme of Information Science comprises one year (60 ec), and focuses on Business Intelligence, Predictive Modeling and Digital Security. The courses are taught in English. Currently, a two-year master programme is in preparation. Upon completing your studies, you will receive your master's degree and you may call yourself *Master of Science (MSc)*.

The master programme of Information Science contains several components:

- a compulsory part (24 ec),
- room for specialisation (12 ec),
- Research and Development (6 ec)
- and of course the master's thesis (18 ec)

Within the *specialisation*, 6 ec should be spent on subsidiary courses that are in some way related to the master's thesis or that provide further deepening of your information science background. The remaining 6 ec is so-called "vrije ruimte" (free choice). The only condition that should be fulfilled here is that there is no overlap between the course(s) of your choice and the other courses of your programme. The courses of your specialisation and free choice must be approved by the Examination board. Some course suggestions are provided in section 3.2.

Within the *Research and Development* component, students may choose whether they want to prepare themselves for a future in research or for a management position as an academic professional. In the first case, they take part in the Research Lab (6 ec); in the second, they take part in one of the two courses of the R&D: System Development Management program (SDM1, 6 ec, or SDM2, 6 ec).

In your *master's thesis*, you will show that you are able to analyse a problem in information science at master level and design a solution for this problem using scientific methods and techniques. It is possible to combine research for the master's project with an internship in a suitable company.

An overview of courses and their time table in the year is presented in the next paragraph.

2.2 Overview of courses

Because there is a lot of choice in the programme, it is rather difficult to present a straightforward picture of the distribution of ec over the year. In the following overview, courses that have one or two asterisks are a matter of choice, and these will influence the distribution of your study load. For example, if you wish to train as a researcher, you will take part in the R&D: Research 2 course in the spring semester, and this means that you will have some extra space in the fall semester to look into courses for your specialisation or free choice. Likewise, if you have found a specialisation course that is planned in the spring semester, it may be more convenient to take part in the R&D System Development Management 2 course in the fall semester.

	Fall semester			Spring semester	
<i>Course code</i>	<i>Course name</i>	<i>ec</i>	<i>Course code</i>	<i>Course name</i>	<i>ec</i>
IMK002	Capita Selecta Information Science	6	IMK001	Business Rules	6
I00152	Research Methods (master course)	3	I00037	Informatics and Society 2	3
I00153	Security in Organisations	6	I00006	Master's thesis Information Science	18
I00158	R&D System Development Management 2*	6	I00157	R&D System Development Management 1*	6
			I00160	R&D: Research 2*	6
	Room for specialisation and free choice**	0-12		Room for specialisation and free choice**	0-12

* Only one of these courses is required

** 6 ec free choice, 6 ec specialisation

The time table of these courses can be generated via the website of the institute:
www.ru.nl/iii/onderwijs/rooster.

Recent changes

The Master programme of Information Science has only undergone a minor change compared to the programme of 2007-2008. The two courses Business Rules (IMK001) and Capita Selecta Information Science (IMK002) have interchanged places, and will now be taught in the spring term and fall term respectively.

If you have any questions about the master programme or are experiencing problems due to the changes that have been implemented either this or last year, please consult the master advisor, Dr. Theo Schouten (T.Schouten@cs.ru.nl).

2.3 Transition programme for post-Polytechnic bachelors ("HBO-doorstromers")

Students who enroll the master's programme of information science following a Polytechnic bachelor training ("HBO-doorstromers") are required to complete a transition programme ("schakelprogramma") consisting of a number of bachelor courses to make up for deficiencies in their prior training. These so-called "schakelcursussen" focus on academic competences relating to the field of information science and preparing for the more advanced level of the master courses. Topics include formal methods and logic, domain modelling, requirements engineering, information architecture and security. Being part of the bachelor programme, "schakelcursussen" are generally taught in Dutch.

The bachelor courses that HBO-doorstromers should complete depend on their prior education. The transition programme is determined following an intake procedure where the individual background of the student is taken into account. There are a number of standard transition programmes that relate to specific education programmes that students may have attended as part of their bachelor degree. These programmes, called "schakelvarianten", are listed below. However, the exact programme for each student will be determined during the intake procedure on the basis of individual background of the student.

Course descriptions of "schakelcursussen" (mostly in Dutch) can be found in section 3.3. Please note that a number of courses of the fall semester start two weeks later (see the course descriptions).

Transition programme variant I/MI (39 ec)

	Fall semester			Spring semester	
course code	course name	ec	course code	course name	ec
IPI003	Domeinmodellering	6	IPK007	Modelleren van Bedrijfsprocessen	3
IPK001	Formeel Denken	6	IPI004	Beweren en Bewijzen	6
I00078	Requirements Engineering	6			
IPK006	Fysieke en Digitale Bouwkunde	3			
IBI002	Security	6			
I00150	Onderzoeksmethoden	3			
Total amount of ec		30		Total amount of ec	9

Transition programme variant BI/CS/BIS (33 ec)

	Fall semester			Spring semester	
course code	course name	ec	course code	course name	ec
IPI003	Domeinmodellering	6	IPK007	Modelleren van Bedrijfsprocessen	3
IPK004	Formeel Denken	6	IPI004	Beweren en Bewijzen	6
IPK006	Fysieke en Digitale Bouwkunde	3			
IBI002	Security	6			
I00150	Onderzoeksmethoden	3			
Total amount of ec		24		Total amount of ec	9

As becomes clear from the above listings, there is some room in the spring semester to take additional courses. Even though post-Polytechnic bachelor students will only be officially enrolled as master students once they have completed their transition programme (see below), they will be allowed to take part in master courses before that time. Suggested master courses for the spring semester are: ICT & Samenleving 2 (course code I00037), Business Rules (course code IMK001) and R&D System Development Management 1 (course code I00157).

More information about the planning of the master programme in combination with the transition programme can be found on the website of the institute:
www.ru.nl/iii/onderwijs/informatiekunde/hbo-doorstroom.

"Schakelverklaring"

As indicated above, post-Polytechnic bachelor students who want to take the master programme at our institute will only be enrolled as master students once they have completed the transition programme.* Before that time, they are registered as bachelor students. In order to change the registration, students should hand over a so-called "schakelverklaring" at the bureau of registration, showing that they have completed the course of the transition programme. This "schakelverklaring" can be obtained from the Education bureau. The procedure for doing so is listed in the appendix.

Please note that even though you are informally allowed to take part in master courses before you have completed the transition programme, **you are not allowed to start your master's thesis project unless you have completed the transition programme and are officially registered as master student.**

If you are a "HBO-doorstromer" and have any questions about your transition programme or anything else related to your studying in our institute, please contact the advisor for HBO-students, Dr. Hanno Wupper, H.Wupper@cs.ru.nl.

(* This regulation may be subject to change in the academic year 2008-2009).

2.4 Extra-curricular possibilities

Studying abroad

In the past years, more and more students decided to visit a foreign university for some time during their study. This may include taking courses, working on a project, or attending a summerschool. There are various possibilities for getting a scholarship, e.g. via the Erasmus program (Europe) and the ISEP program (USA). Within the Erasmus program, our institute has relations with universities in different countries such as Sweden, Denmark, Spain, Portugal and Hungary, but a scholarship in other countries is possible as well.

Via a scholarship you may study abroad for a period of 3 to 12 months. Credits (ECs) obtained abroad can usually be acknowledged by the sending university in the Netherlands. In this matter the Examination board can help you select courses that also satisfy the conditions set by our university. You may also consult the coordinator of external relations at ICIS, Prof.Th. van der Weide (Th.P.vanderweide@cs.ru.nl), who can help you set up communication with another university. For matters concerning an application for a scholarship, you may contact the External Relations Office of the Radboud University (www.ru.nl/er/).

Study trip: ICT in a different culture

Our institute take special interest in contributing to the development of ICT in other cultures. Our staff members have been involved in lecture programmes in countries like Ghana, South-Africa and Uganda, and students have the opportunity to take part in study trips abroad. Countries that have been visited thus far include South Africa, Uganda and India (see studiereis.cs.ru.nl and www.ict4kids.nl for some reports and additional information in Dutch).

Such extracurricular activities are embedded in courses which are not part of the compulsory programme, but which can be taken as part of the specialisation or free choice in either the Bachelor programme (Community Outreach Project) or the Master programme (ICT in a different culture). A course description of the latter course can be found in section 3.2 of this prospectus.

3 Course Descriptions

3.1 Courses of the master programme

Business Rules

Course ID: **IMK001** 6 ec second semester prof. dr. H.A. Proper

Introduction

The behaviour of modern day enterprises, as well as society, is largely determined by *rules*.

Examples of such rules are:

1. Taxation laws.
2. Rules governing the application of mortgages.
3. Guidelines guiding doctors in diagnosing patients.

Sometimes these rules reflect *laws* which one would like to enforce strictly. At other times, they represent best-practices that aim to guide people in performing their work.

Collectively one may refer to these rules as *business rules*. Business rules constrain/guide the behaviour of businesses/enterprises, both with regard to operational processes as well as change processes. In this course we will investigate several aspects of such rules. For example, the modelling processes required to obtain these rules, the languages needed to express the rules, as well as the measurements needed to enforce them. With regards to the process of modelling business rules, we will take the perspective that this involves a specific kind of knowledge engineering since business rules essentially capture organisational knowledge.

Finally, business rules are a means to an end. Some parties must have some reason to regulate the behaviour of/in an enterprise/society. In this need we find the rationalization for business rules and their deployment. We will take a risk management perspective in reasoning about such regulatory need, allowing us to take a cost-benefit perspective on business rules and their deployment.

Objectives

After attending this course, students are able to:

- argue about the role of business rules in enterprises and society,
- compare and position different strategies/approaches for the formulation and rationalisation of business rules,
- compare and position different languages to represent business rules,
- compare and position different strategies/approaches for the deployment of business rules.

Examination

50% A written exam with questions pertaining to the papers read during the course.

40% The case study.

10% Presentation(s) of read paper(s).

Capita Selecta Information Science

Course ID: **IMK002** 6 ec

first semester

prof. dr. ir. T.P. van der Weide

dr. ir. R. Brinkman

Introduction

The course Capita Selecta Information provides an introduction to the main themes of the master program Information Sciences:

1. Business Intelligence
2. Digital Security: the digital detective
3. Predictive Modeling

Objectives

After this course the student is familiar with the basic methods and techniques that are used in the main themes of the master program Information Sciences:

1. Business Intelligence
2. Digital Security: the digital detective
3. Predictive Modeling

Furthermore, the students have a realistic impression of the state-of-the-art in each of these themes.

Subjects

The course consists of the following blocks:

1. Business Intelligence
2. Digital Security: the digital detective
3. Predictive Modeling
4. Student contributions

In the first three blocks the students become acquainted with the state-of-the-art methods and techniques in the main themes of the master program. In the 4th block students present papers from recent conferences.

Teaching methods

Different speakers will contribute to this course. Each lecture will have a number of exercises. The students will also read, summarize and present a recent paper of a relevant conference. The student contributions are peer reviewed.

Examination

The first three blocks are evaluated with a separate test.

Prerequisites

Basic knowledge in Information Science at Bachelor level.

Informatics and Society 2

Course ID: **I00037** 3 ec

second semester

dr. L. Consoli

Study investment

- 32 hrs lecture
- 6 hrs personal study counseling

Introduction

Starting from the concepts of privacy and the relationship between informatics and political decision-making processes, we will move on to examine the changes in our way to look at the world caused by the progresses of information technology. We will analyze among others the cultural meaning of hackerism, the role different ethical frameworks play in discussing technological advances, and the social/ethical/cultural implications of artificial intelligence (AI).

Objectives

The course Informatics and Society 2 (Informatica en Samenleving 2) explores cultural and social issues that have been made possible by the development of information technology

Examination

Students will have to write some short essays and a final long one. There is no final examination planned.

Literature

Literature references and reading material will be made available through Blackboard.

Website

www.ru.nl/fil-beta/lucac

Master's thesis in Information Science

Course ID: **I00006** 18 ec

first or second semester

Various lecturers

Objectives

The student is able to analyse a problem in information science at master level and design a solution for this problem using scientific methods and techniques. It is possible to combine research for the master's project with an internship in a suitable company.

Prerequisites

Students need to have completed their Bachelor degree (for regular bachelor students) or additional "schakelcursussen" (for post-Polytechnic bachelor students) before they are allowed to start their master's project.

Website

www.cs.ru.nl/mlt/index.html

Extra information

Please check the website of the master's thesis lab www.cs.ru.nl/mlt/index.html for important procedures relating to the start of your thesis work.

Research methods (master course)

Course ID: I00152 3 ec

first semester

dr. S.J.B.A. Hoppenbrouwers

Study investment

- 10 hrs lecture
- 6 hrs problem session
- 1 hrs personal study counseling
- 24 hrs student project
- 43 hrs individual study

Introduction

How do you get reliable findings concerning subjects that cannot be captured in a mathematical formula, a test tube, or a computer memory? For example, concerning people and organisations: their opinions, attitudes, behaviour, interaction, language, communication? A researcher in the field of information science creates bridges between typical gamma issues (organisational context, documentation) and bèta-issues (exact science, engineering, technology).

In this course we look at and practice a number of research methods and techniques relevant for information science. It is a "hands on" course: you gain practical experience in (applying) a method of choice and share your experiences with your fellow students (also concerning other methods). The methods/techniques concerned are interviews, workshops, text analysis, and think-aloud protocols.

Objectives

After completion of the course the students can:

- Describe the taught methods and techniques, and the relations between them;
- Decide for each of the methods described whether a method is fit for answering a certain research question;
- Independently and skillfully apply at least one of the methods: make an operational research plan, gather data, analyze data, draw conclusions, present results;
- Relate results to model-based analysis, at the hand of a sound conceptual model of the specific research domain

Subjects

- Qualitative research
 - Interviews
 - Workshops
 - Text analysis
 - Think Aloud protocols
- Interpretation in science

Teaching methods

After a series of introductory lectures, a hands-on project is done (in small groups) in which the students tackle a real bit of research. Emphasis is on actually doing the real, "messy" work involved in doing research, which leaves less time than usual for planning and reporting. The course therefore focuses on giving the student some limited but real research experience rather than on creating a research plan (which is the aim of the earlier, undergraduate Research Methods course). The project is communicated via the digital workplace (Wiki) of the institute. Regular group feedback sessions and best practice discussions are part of the course setup.

Examination

Evaluation of students is based on their research report (and its evolution as observed on the Wiki), the related oral presentation, and the best practice report. In addition, there will be a small written test that will establish the students knowledge of methods not actually applied by him/her in the course.

Prerequisites

To partake in this course successfully, you should have qualified with respect to basic methodology, for example by successfully completing the bachelor's course "Onderzoeks methoden". In particular, you can:

- Give criteria for the design and execution of scientific research;
- Apply these criteria to concrete cases;
- Formulate and operationalize research questions; wield the terms conceptual model, empirical model, domain, variable, level of measurement, relation;
- Use advanced querying systems to find professional literature.

Literature

Syllabus: will be provided digitally.

Website

www.cs.ru.nl/~tomh/onderwijs/om2

Extra information

This course is the sequel to the basic course "Onderzoeks methoden" in the Bachelor. Research questions and methods play a role in numerous other courses, but are particularly relevant to the writing of the Master's Thesis.

R&D: Research 2

Course ID: I00160 6 ec

second semester

dr. J.H. McKenna
prof. dr. J.H. Geuvers

Study investment

- 144 hrs individual study
- 6 hrs personal study counseling
- 18 hrs lecture

Introduction

The course R&D: Research 2 (RDR2) builds upon the knowledge acquired within R&D: Research 1 (RDR1).

However, in RDR1 a literature study was good enough, but in RDR2 it is not. Students are expected to really bring their own contributions into the research.

The results need to be written down in a scientific paper and need to be presented.

Objectives

After the course the student should be able to:

- Come up with a good research proposal.
- Act on that proposal.
- Select appropriate scientific methods for answering the research question.
- Work together with an expert in the research area.
- Be able to put own results in the scientific context.
- Transform technical results into readable text.
- Present the research using slides.

Subjects

The topic for the research is free. Each student chooses his own supervisor within the department and together they come up with an appropriate topic. This idea is worked out into a research proposal.

Teaching methods

There is typically one lecture that is used to explain how this course works.

Furthermore, there are approximately eight obligatory presentation sessions.

And finally, there are a few individual progress meetings.

Examination

Basically the supervisor determines the grade for your research project.

However, via an oral exam the student needs to prove that he did not only write the paper but is also able to talk about it. This can lead to a small adjustment of the grade by the supervisor.

Finally, activity and/or absence during presentation sessions can also adjust the grade slightly.

Prerequisites

You must have followed RDR1 seriously, which means that at least you should have handed in a draft paper.

Literature

Students have to find their own literature.

Website

www.cs.ru.nl/~hubbers/courses/rdr2

Extra information

Because we ask staff members to reserve time for supervising projects, we expect from students also that they reserve enough time for this course!

R&D: System Development Management 1

Course ID: I00157 6 ec

second semester

dr. T.E. Schouten

Study investment

- 40 hrs individual study
- 112 hrs student project
- 16 hrs lecture

Introduction

SDM1 resembles the phase in an IT career in which the project leader takes responsibility for the management of a software development project. Within SDM1 we address the project management aspects of the whole life cycle of a system development project, from definition study through system design, system development and system implementation all the way to the maintenance of a system in an operational environment.

The course consists of a theoretical (2EC) and a (4EC) practical component. The practical component is being carried out within "GiP-House", managing students from the "Software Engineering course. GiP-House closely resembles a real-life modern softwarehouse in which the students of this course perform roles as: Project manager, Quality manager, Contract Owner, Public Relations Manager, Director. These roles can be adjusted depending on the specific situation of a given semester (e.g. number of students). All students work, within the management structure of GiP-House, under the supervision of the director, with the aim to create an effective and efficient software house management structure. The managers use, if necessary, (internal or external) experts.

Objectives

SDM1 has the aim that the student, at the end of the course, has all the professional skills of an IT project leader.

Subjects

For topics, see the website:

- project management
- metrics
- scheduling and tracking
- capability maturity model
- component based development
- implementation
- team management, project organization
- requirement analysis

Teaching methods

There will be 8 presentations of 2 hour each.

Further working as a manager for about 112 hours as a manager in GiPHouse.

Examination

- Serious participation in the practical part is required. If this is judged insufficient the student has failed the course, and is not allowed to take part in the written examination
- a 2 hour written examination, this determines the final grade. No literature may be consulted during the examination.

Prerequisites

Bachelor Computing or Information Science

Literature

- *Software Engineering A practitioners Approach: European Adaptation*, sixth edition , Roger S. Pressman
- Sheets of the presentations

Website

www.cs.ru.nl/~ths

Extra information

Many students entering with a HBO bachelor will already have experience as manager in software projects. If that experience is sufficient to have obtained the goals of the practical part of this course, the teacher can exempt the student from the practical part. The procedure to obtain this will be indicated by the teacher at the beginning of this course.

R&D: System Development Management 2

Course ID: **I00158** 6 ec

first semester

prof. dr. M. van Vliet

Study investment

- 90 hrs individual study
- 40 hrs student project
- 38 hrs lecture

Introduction

The course 'System Development Management 2 (SDM2)' is part of the System Development Management (SDM) stream. SDM2 is a follow-up course on SDM1. SDM2 has the aim that the student, at the end of the course, has all the professional skills of a manager of a software-house. The development of the student as a manager depends on the chosen career-path by the student. At the end of the course this is evaluated in a Professional Role Review. The course consists of a practical part (GiPHouse) and a theoretical part. In the theoretical part the students have regular classes and they work on an integral case study which is woven into the course.

Objectives

SDM2 has the aim that the student, at the end of the course, has all the professional skills of a manager of a software-house. Within SDM2 the student is, as a manager, responsible for the software-house environment in which systems are developed based on a realistic case.

At the end of SDM2 the student should have build up competencies in these areas:

1. To work as a manager in a team with clearly defined tasks, deliverables and constraints.
2. To work independently with regard to software development and to assess and improve the quality of the process.
3. To guide, assess and implement the most suited software development methodologies for the given case.
4. To be able to guide the future development of a software-house.
5. To select and implement the most appropriate software development tools for the given case.
6. To select and implement the best system-architecture (programming languages, software development tools, hardware, middleware, and communication components) for the given case.
7. To be able to guide the process of building, testing and implementing a system with the aim to implement a reliable, maintainable, well-documented and well-tested system (quality assurance).
8. To be able to recognize communicative and organizational issues in a software-house environment and to effectively act upon that.
9. To be able to take account of the human, organizational or social consequences (possibilities, constraints, boundaries and risks) of the management of a software-house in the real-life world.
10. To be able to convey knowledge in both oral as in written form.
11. To be able to present and defend a proposal and to be able to be effective in written and oral communication in a project environment.
12. To work at an academic level: to be able to assess one's own performance and the ability to improve upon that.
13. To be able to work independently on one's own professionalism: to gain and create knowledge based upon own literature survey and gained advice.

Subjects

The course consists of a theoretical and a (large) practical component. The practical component is being carried out within 'GiP-House'. GiP-House closely resembles a real-life modern softwarehouse. SDM2 resembles the phase in an IT career in which the manager takes responsibility for the management of a software-house. The student is involved in the management of the students that follow the SDM2 course and directs the projects that the GiP-House student are involved in (tactical management). Furthermore, the SDM2 student is involved in preparing the GiP-house for the future (strategic management). This involves acquisition of new projects, the structure and management of the GiP-House, internal improvement projects within GiP-House and implementing new system development methodologies within the projects of GiP-House. Within SDM2 we expect from the student an academic working habit, in which taking responsibility for one's own actions and the corresponding achieved results is a very important aspect.

Teaching methods

Within GiP-house the student aims at two goals: realising their own personal development goals, and delivering a high quality system. In this structure the focus is very much on teamwork in order to realise the required deliverables.

Examination

It is necessary that a student works seriously within the practical part of SDM2. Without serious participation in the practical component, a student shall not receive grading for this course. At the end of the course there is a written exam on the subject lectured in the theoretical component of SDM2.

Prerequisites

1. A student has experience in one of the manager roles as executed in SDM1.
2. A student is capable to work in a real-life project situation at the level of a senior software engineer.
3. A student is able to work within teams (GiP-House).
4. A student has enough knowledge of methods and tools to execute innovative software engineering projects.

Literature

1. Course books form the GiP-House library.
2. Course material handed out during the course.
3. Online GiP-House handbook (www.cs.kun.nl/is/edu/gip/hb/inhoudsopgave.html).
4. GiP-House website (www.giphouse.nl).

Extra information

SDM2 can be combined with courses from the Faculty of Management (www.ru.nl/nsm).

Within the practical component of SDM2 the student can perform the following roles:

Projectmanager, Qualitymanager, Contract Owner, Public Relations Manager,

Director. These roles can be adjusted depending on the specific situation of a given semester (e.g. number of students). All students work, within the management structure of GiP-House, under the supervision of the director, with the aim to create an effective and efficient software house management structure. The managers use, if necessary, (internal or external) experts.

For further information on GiP-House, please contact Dr. Theo Schouten at ths@cs.ru.nl.

Security in organisations

Course ID: I00153 6 ec

first semester

drs. P.J.B. van Rossum

Study investment

- 98 hrs individual study
- 8 hrs personal study counseling
- 30 hrs student project
- 32 hrs lecture

Introduction

Security is about regulating access to assets. Crucial questions are: Who are you? and: Should you be doing that? These questions cannot be answered without taking the organisation in which security systems are deployed into account.

The course introduces the basic notions and techniques in the area of information security. The emphasis lies on assessing risks and impacts of security related threats and on planning, managing and evaluating security controls such as policies, procedures, and technical counter measures.

Objectives

- To develop a suitable level of paranoia, needed for designing and deploying security sensitive IT applications
- To learn how to manage risk while designing and deploying IT systems within an organisation
- To learn how to write and enforce good security policies
- To learn some basic techniques for evaluating security solutions

Subjects

- Security in context
- Assets and threats
- Risk, vulnerability, control, attack, damage
- Risk assessment and risk management
- Methods/tools for risk analysis
- Attack trees
- Security policies
- Roles, Classifications
- Code of Practice for Information Security (ISO27001/2)
- Business continuity planning and incident recovery
- CERTs
- Legal Aspects

Teaching methods

The course consists of 2 hours of lectures per week.

Examination

Mandatory assignments and mandatory written exam.

Prerequisites

The bachelor security course Security.

Literature

To be announced later. The book that was used in previous editions of this course (by Jan Killmeyer Tudor) will NOT be used.

Website

www.cs.ru.nl/~martijno/secorg

Extra information

Related courses:

- Software security
- Network security
- But also appropriate courses related to computers and law are an option

3.2 Course suggestions for specialisation or free choice

Cognition and Representation

Course ID: **I00054** 6 ec

first semester

dr. J.J. Sarbo

Study investment

- 104 hrs individual study
- 4 hrs personal study counseling
- 30 hrs problem session
- 30 hrs lecture

Introduction

The term "representation" usually refers to formalization, including a deductive or inductive use of formalized knowledge. This view, maintained by computer science, is opposed to the interpretation of knowledge by cognitive theory, according to which it is an expression of thoughts by a human observer. In this course we learn how these two conceptions of knowledge, formal and meaningful, can be linked with one another through a cognitively based model of knowledge representation. In addition, we learn how the proposed representation can be used for a uniform modelling of knowledge in different domains.

Objectives

- Making acquaintance with a semiotic concept of signs.
- The definition of a model of cognitive activity.
- Introduction of a model for logic, language, and mathematics.
- Learning the differences between formal and human interpretation.
- Using the cognitive model for problem elicitation.

Subjects

- Signs and interpretation
- Conceptualization processes
- Processing schema
- Problem elicitation as a conceptualization process
- Naïve logical interpretation
- Syntactic language model
- Application in reasoning and mathematics
- Application in Text summarization

Teaching methods

This course makes use of problem directed education. The students are individually working on weekly exercises. A full solution of the exercises are developed in class.

Examination

A midsemester and a final test, both must be 5.5 or higher. The final grade is defined by the average of the two tests. This test grade can be adjusted by the average grade for the weekly exercises, but only if the latter is above the test grade (otherwise, no correction is applied).

Prerequisites

Basic knowledge in propositional logic, as well as in deductive and inductive reasoning (including mathematical induction) is required.

Literature

The Lecture Notes of the course are distributed via Blackboard.

Website

osiris.cs.kun.nl/~janos/CR.html

Computational Intelligence

Course ID: **I00025** 6 ec

second semester

dr. P.J.F. Lucas

dr. A.J. Hommersom

dr. N. Carvalho Ferreira

Study investment

- 78 hrs individual study
- 10 hrs personal study counseling
- 6 hrs laboratory course
- 20 hrs student project
- 24 hrs lecture
- 10 hrs problem session
- 20 hrs student presentation

Introduction

Handling uncertain knowledge has been one of the central problems of AI research during the past 30 years. In the 1970s and 1980s uncertainty was handled by means of formalisms that were linked to rule-based representation and reasoning methods. Since the 1990s probabilistic graphical models, in particular Bayesian networks, are seen as the primary formalisms to deal with uncertain knowledge. Both early and new methods for representing uncertainty are studied in the course, where in particular various aspects of Bayesian networks are covered.

Objectives

At the end of this course, the student should be able to:

- understand the principles of reasoning under uncertainty
- understand different numerical models for the representation of uncertainty, such as the CF model, the subjective Bayesian method, Bayesian belief networks, and possibly Dempster-Shafer theory
- have insight into model-based approaches to AI
- have insight into the pros and cons of learning models versus using expert knowledge
- have some experience in experimenting with computational intelligence systems to solve problems involving probability theory

Subjects

- Introduction to Computational Intelligence
- Early models of uncertainty
- Probability theory
- Bayesian networks: principles
- Markov independence
- Reasoning with Bayesian networks
- Building Bayesian networks
- Learning Bayesian networks

Teaching methods

lectures, seminar, tutorials, practical assignment

Examination

Written exam in addition to seminar presentations and practical work.

Prerequisites

Course "Intelligent Systems"

Literature

- P.J.F. Lucas and L.C. van der Gaag, Principles of Expert Systems, Addison-Wesley, Wokingham, 1991, Chapter 5.
- K.B. Korb and A.E. Nicholson, Bayesian Artificial Intelligence, Chapman & Hall, Boca Raton, 2004.
- R.G. Cowell, A.P. Dawid, S.L. Lauritzen and D.J. Spiegelhalter, Probabilistic Networks and Expert Systems, Springer, New York, 1999.
- F.V. Jensen and T. Nielsen, Bayesian Networks and Decision Graphs, Springer, New York, 2007.

Website

www.cs.kun.nl/~peterl/teaching/CI

Extra information

The course is part of the AI Masters and also suitable for AI students.

Foundations of Information Systems

Course ID: **I00035** 6 ec

second semester

dr. P. van Bommel

Study investment

- 104 hrs individual study
- 32 hrs lecture
- 32 hrs problem session

Introduction

In this course we study foundations of information systems in detail. These fundamental aspects will be organized around the notion of *transformation of information models*. We will specify the *syntax and semantics* of concrete transformations. This will lead us to a framework for *reasoning* about transformations, in which different design strategies can be considered, for example quality-driven design strategies. Our study of foundations has a theoretical nature, but practical cases will also be considered.

Objectives

You will learn:

1. transformation of information models
2. reasoning about transformations
3. optimization of transformations

Subjects

- Basic *information language* with a suitable representation mechanism.
- *Complexity* of the representation mechanism.
- *Wellformedness conditions* for representations, with a parameterized generation algorithm.
- *Correctness proof* of generation algorithms.
- Rule-based *population transformation* and operation transformation.
- Distinction between generation operators and *mutation operators*.
- Application of these operators in (*interactive or automated*) *design processes*.
- *Predicting and comparing the behaviour* of different transformation strategies.

Examples of transformations are the following. *Data format* may change when it is transferred between systems, including changes in data structure, data model, data schema, data types.

Interpretation of data may vary when it is passed on from one person to another. Changes in interpretation belong to data semantics rather than data structure. *Level of detail* may change when exchanging data between departments or organizations, for example going from co-workers to managers or from local authorities to central government. *Systems development phase* of data models may vary, for example when implementation-independent models are mapped to implementation-oriented models.

Examination

Individual student paper and central written examination.

Prerequisites

It would be good if you have some experience with information models, for example the relational model or the entity-relationship model (or a similar model). Furthermore, it would be good if you can handle basic mathematical definitions.

Literature

- The *lecture notes*
- Instructions for the *student paper*
- *Handbook of data modelling* (from 1959 until 2008)
- Suggestions for *further reading* (not required)

ICT in a different culture

Course ID: **IMI001** 6 ec

first semester

prof. dr. ir. T.P. van der Weide

Introduction

This course is an international broadening course to explore levels, practice and opportunities & threats for Information and Communication Technology in a non-western context.

Each year, some specific context is chosen, referred to as the country of interest. This context is further refined by specific research projects.

Objectives

As a result of active participation in the student study tour and a substantive study of literature, the student will be able for the specific situation in the country of interest:

1. To describe the overall economic situation, and the governmental policy relating to it. Furthermore also the situation on micro economic level; trained and untrained people, employees of small businesses, unemployed and people living in rural and urban areas.
2. To describe the educational level of the schools and universities, and the governmental policy towards it. Also the policy towards people without access or with difficult access to education, and its corresponding educational level.
3. Outline how the different levels described in B answer the demand of the market, and also how the levels compare to the Dutch educational levels.
4. To indicate the opportunities for Computing Science and Information Science research for both universities and industry.
5. To indicate current ICT utilisation in at the universities, government and industry both in the urban as well as in the rural areas. Hereby you will focus on the type of demand, and to what extent the current level of access can answer this demand.
6. To describe the current status of the infrastructure in the country of interest with special emphasis on availability of hardware (distribution and communication channels, supply of parts), opportunities for maintenance and available knowledge and skills (at several levels including the Dutch vocational levels MBO and HBO).
7. To be able to motivate to your own insight which types of development work have the desired effect, and how they correlate with governmental policies.

After successful completion of the course, students are capable of providing a motivated answer on questions regarding the role of ICT in the country of interest, focusing on the one hand on usefulness and sensibility issues and on the other hand on feasibility restrictions and opportunities in the context of

- industry (in what sectors and what problems can be expected?)
- government (idem)
- university (idem)

This should also includes cultural and other societal aspects of relevance.

Teaching methods

The course is organized around a number of small research projects that preferably are supplied by companies participating in this course. Companies are invited to participate in this course, and to contribute interesting research projects.

The course consists of three phases:

1. Initial phase. The students formulate their research question, and prepare the research to be done during the visit in the country of interest. Also they prepare themselves on the specific cultural background of that (part of the) country. During this phase, the organization of the concluding seminar is set up.
2. The actual research phase: 10 days research in destination country.
3. Evaluation phase. During this phase, the students will finish their research report. Furthermore, they will organize a seminar in which the results are presented. Some extra activities are also organized during this seminar, such as guest speakers and a forum discussion.

The students work in groups on their research projects. At regular moments they provide feedback on the performance of the other members in their group. This feedback will be used during the assignment of an individual mark for each participant. After the initial phase there will be an intermediate mark. A positive intermediate mark is required to participate in phase 2.

The students will also be part of organization tasks such as the organization of the seminar, p.r. activities, creating a professional combined research evaluation report for internal and external distribution. This contribution will also be part of the mark of each student.

Examination

The students write a short paper about their research. Furthermore, the students are marked for their contribution to organizational activities in the context of this course (such as organizing the final seminar).

Website

studiereis.cs.ru.nl

Information Retrieval

Course ID: **I00041** 6 ec

second semester

prof. dr. ir. T.P. van der Weide

Study investment

- 68 hrs problem session
- 40 hrs individual study
- 60 hrs lecture

Introduction

Finding relevant documents no longer seems to be the major challenge of state-of-the-art search engines. Where recall and precision were major concerns in the early days of their existence, trying to convey information rather than just data seems to be a major concern nowadays. Offering a long list of documents in order of their relevancy score is known to be a too simple interface.

In order to improve on this, solid knowledge of the information retrieval problem and its main techniques is imperative. As there are still many questions about the essentials, a strong relation with ongoing research activities is indispensable. IR (A constructive approach to Information Retrieval) treats the backgrounds of Information Retrieval:

1. How do people search for information, and how can this be formalized?
2. How do people describe what they mean, and how can we formalize meaning?
3. How can these points be combined?

An important application area is the Internet.

Objectives

The goals of the course IR (A constructive approach to Information Retrieval) is that its participants

1. are familiar with the base models that are used for Information Retrieval.
2. have knowledge of query languages, both syntactically and semantically.
3. are familiar with information extraction from documents, inter-document relations and their appreciation.
4. have insight and proficiency in design and construction of search engines.
5. have insight in interaction techniques to support searchers in their quest for information.
6. have some experience with scientific literature in this field.

Subjects

The course consists of three main parts:

1. Fundamentals
 1. After a discussion on the problem areas of Information Retrieval,
 2. the evaluation methods for Information Retrieval are discussed.
 3. The Boolean model is discussed, together with techniques related with inverted list document representation.
 4. The vector model is the most used model. As a method for knowledge extraction, the singular value decomposition (main component analysis) is discussed.
 5. The probabilistic model applies Bayesian learning techniques to Information Retrieval.

2. Knowledge extraction and Information processing
 1. Query languages in relation with cognitive aspects of information searching.
 2. Autonomous query improvement techniques (global context analysis). Guided query improvement techniques (feedback).
 3. Pseudo relevance feedback (local context analysis).
 4. Clustering techniques for knowledge extraction
3. Document relations on the Web
 1. Web retrieval.
 2. Exploring the reference structure between documents (for example, page rank).
 3. Exploring document appreciations (collaborative techniques).
 4. Special topics contributed by the participants

During the course, guest speakers are invited to discuss state-of-the-art topics.

Teaching methods

1. The course is divided in three parts, each part is concluded with a test.
2. Each week there are 4 contact hours, in which the new material is presented and exercised.
3. The participants have to make a contribution to the course (see below).

Student contribution

Participants have to choose a topic from the most recent TREC conference. These contributions will be centered around special themes in Information Retrieval. The themes will vary from year to year. The actual themes will be announced during the lectures.

The students make an extended summary of the topic chosen, and present this during the lecture. The contributions are peer reviewed by the participants of the course.

Examination

The exam for IR consists of 4 exercises, and leads to a mark (e).

The first three exercises correspond to the three parts of the course. If the corresponding test resulted in a mark ≥ 6 , then the participant may choose to skip this part of the exam. In that case the mark for the test is the mark for that exercise. Would the participant choose to make the exam exercise, then the mark for the test is assumed to be cancelled.

The 4th exercise is associated with the personal student contribution. If this contribution has a mark ≥ 6 , then this will be the score of exercise 4. In the other case, the student will have to make exercise 4.

During the course homework exercises will be handed out. Each exercise is reviewed with a score -1, 0 or +1. This results in a bonus score (b).

The final result is obtained as follows:

if $e \geq 6$ then $e + b/10$ else e

This special arrangement is not valid during the re-exam.

Prerequisites

Participant of IR (A constructive approach to Information Retrieval) should have the base qualifications as provided by the bachelor Computing science or Information Science.

Literature

Lecture notes will be made available via Blackboard.

3.3 Courses of the transition programme (schakelprogramma)

Beweren en Bewijzen

Vakcode: **IPI004** 6 ec

tweede semester

dr. H. Wupper

dr. E.M.G.M. Hubbers

ir. J.K. Berendsen

Studielastverdeling

- 40 uur hoorcollege
- 40 uur responsiecollege
- 50 uur projectwerk
- 2 uur individuele begeleiding
- 36 uur zelfstudie

Inleiding

Hoe bereikt men helderheid? Wanneer is een bewering waar? Wanneer doet een ICT-systeem wat het moet doen? We beschouwen verschillende toepassingsgebieden van taal, juridische wetten bijvoorbeeld, en contracten. Voor informatici belangrijke speciale gevallen zijn specificaties (als contract) en algoritmen (uitvoeringsvoorschriften, speciale gevallen van een speciaal geval van wetten). We gaan uit van uitspraken in natuurlijke taal. Deze gaan we

- analyseren en beperken tot constructies die we echt begrijpen, en
- formaliseren, d.w.z. in een notatie gieten met een goed gedefinieerde betekenis.

Vervolgens gaan we

- bestuderen, aan welke regels deze formele uitspraken onderhevig zijn en hoe men tot aantoonbaar ware uitspraken kan komen,
- dit toepassen op de ontwikkeling en validatie van systemen die doen wat ze moeten doen,
- dit alles exemplarisch vergelijken met benaderingen, gebaseerd op enige andere formalismen (SQL, state based systems).

Leerdoelen

Algemene bekwaamheden

- inconsistenties en incorrectheden aanwijzen in niet deugende uitspraken
- heldere, consistente en correcte uitspraken formuleren
- de correctheid van eigen beweringen beredeneren
- oplossingen systematisch kunnen afleiden c.q. een systematische afleiding presenteren
- actief en constructief meewerken aan het verhelderen van onduidelijke uitspraken
- teksten en discussies structureren d.m.v. begripsdefinities
- het onderscheid kunnen aangeven tussen natuurlijke taal en formele talen
- professioneel kunnen omgaan met verschillende notaties voor dezelfde taal

Specifieke bekwaamheden Logica

a) propositie- en predikatenlogica

- herkennen welke redeneerproblemen met propositielogica worden aangepakt en welke niet
- beweringen in natuurlijke taal omzetten naar logica
- de betekenis van logische formules helder in natuurlijke taal weergeven
- de betekenis van de regels voor natuurlijke deductie aangeven
- eenvoudige beweringen bewijzen of weerleggen met behulp van natuurlijke deductie
- bewijzen netjes opschrijven

b) propositielogica

- voor gegeven beweringen de waarheidstabbel opstellen
- voor gegeven beweringen aangeven of deze tautologisch zijn
- redeneerfouten herkennen en blootleggen
- aangeven welke verzamelingen van voegtekens al dan niet functioneel volledig zijn

c) informatica

- relevante eigenschappen van eenvoudige ingebouwde real-time-systemen en hun onderdelen logisch specificeren
- de juistheid van logische specificaties aantonen
- systemen hierarchisch onderverdelen
- op basis van logische specificaties bewijzen dat een uit de juiste onderdelen samengesteld systeem de verlangde eigenschappen heeft
- systeemanalyse, systeemontwerp en correctheidsbewijs helder presenteren
- het verband aangeven tussen logische en enkele andere specificatieformalismen

Onderwerpen

Realiteit, abstractie, modellen, contracten, verborgen aannames, natuurlijke en formele talen, syntaxis en semantiek, typering, propositie- en predikatenlogica, waarheidstabellen, semantische tableaux, natuurlijke deductie, specificatie, correctheid van systemen, Chinese dozen (hiërarchische decompositie), bewijsassistenten

Toelichting werkvormen

In de elektronische werkplaats werken we samen aan grote projecten en wekelijkse opdrachten. We formuleren in natuurlijke taal zo precies mogelijk wat een bepaald ICT-systeem moet doen (bijvoorbeeld botsingen tussen treinen en auto's voorkomen) en zetten deze specificatie vervolgens om in een formele taal: de predikatenlogica. Daarbij komen we vanzelf allerlei ambiguïteiten tegen; de logica dwingt ons, deze op te lossen. We specificeren op dezelfde manier de aannames die we redelijkerwijs kunnen maken over de onderdelen van zo'n systeem (slagbomen, treinen, besturingskastje, wegenwet). Als alles klopt en goed in elkaar zit, moet formeel bewezen kunnen worden dat het systeem inderdaad aan zijn specificatie voldoet. Om de studietaken competent uit te voeren leer je in zelfstudie iedere week nieuwe stof. In responsiecolleges bespreek je je eigen oplossing en die van anderen.

Toetsvorm

De cursus bestaat uit een aantal inhoudelijke blokken. Elk blok wordt afgesloten met een schriftelijk deeltentamen. Ook maak je een groot werkstuk. Voor elk schriftelijk tentamen en voor het werkstuk moet je ten minste een 5,5 hebben.

Vereiste voorkennis

Vertrouwd zijn met het verschil tussen een informele en een formele benadering op het niveau van de cursus Formeel Denken, Discrete Wiskunde of een vergelijkbare cursus. Enige ervaring met modellering. Enige ervaring met een aantal formele (programmeer- en modelleringstalen).

Literatuur

Aanbevolen: J.F.A.K. van Benthem et al.: *Logica voor informatica*; Pearson Education Benelux, 2003, ISBN 90-430-0722-6 of een oudere of nieuwere oplage. Het is een boek waar je ook later nog veel aan kunt hebben. In deze cursus gebruiken we er alleen bepaalde onderdelen van. Je mag ook oudere oplagen gebruiken, het scheelt niet veel.

Website

lab.cs.ru.nl/algemeen/Beweren_en_bewijzen

Domeinmodellering

Vakcode: **IPI003** 6 ec eerste semester (N.B. deze cursus drs. G.F.M. Paulussen begint twee weken later) prof. dr. ir. T.P. van der Weide

Studielastverdeling

- 15 uur werkcollege
- 76 uur zelfstudie
- 45 uur hoorcollege
- 32 uur projectwerk

Inleiding

Deze cursus behandelt een aantal aspecten die belangrijk zijn binnen de gehele 'levenscyclus' van informatiesystemen. Essentieel is om het betreffende 'domein' goed te begrijpen, correct af te bakenen, de belangrijke concepten binnen dat domein te identificeren, hun onderlinge relaties te bepalen, en vast te leggen aan welke beperkingen hun gedrag moet voldoen. We leggen onze bevindingen vast in een conceptueel (data)model, dat niet alleen communicatie over het domein maar ook redeneren over domein en model mogelijk maakt.

Vanuit dat model zullen we delen van het gewenste informatiesysteem, zoals de onderliggende databasestructuur, afleiden.

Je past je kennis toe in een casus.

Leerdoelen

Na deze cursus kan de student:

1. zinnen in natuurlijke taal omzetten naar de ORM-normaalvorm
2. uit een domeinbeschrijving systematisch een conceptueel ORM-model afleiden
3. conceptuele operaties op een domein uitdrukken in termen van de taal ORC
4. ORC voor 'formeel redeneren' toepassen binnen eenvoudige systemen
5. SQL-queries opstellen, ook voor niet-triviale gevallen
6. een conceptueel model transformeren naar een efficiënte relationele database-structuur onder handhaving van bestaande domein *constraints*
7. de relatie uitleggen tussen proces-georiënteerde en feit-georiënteerde aanpak basistechnieken uit de UML toepassen om een conceptueel model te maken en zo'n model transformeren naar ORM of een relationele database-structuur.

Onderwerpen

De cursus is georganiseerd in 2 blokken:

1. Modeleren en Redeneren:
 - *UoD* (Universe of Discourse); gecontroleerde taal
 - conceptueel schema; ORM (Object Role Modeling)
 - ORC (voor formuleren eigenschappen en operaties en bewijzen van eigenschappen)
 - formele versus informele wereld
2. Transformeren en implementeren:
 - SQL: syntax, semantiek, opstellen queries via verfijning
 - transformatie tussen ORC en SQL
 - 'relational transformation'; 'optimized schema', bewaking beperkingsregels
 - Object-Life model; proces gerichte benadering
 - UML (Unified Modeling Language)

Toelichting werkvormen

Een deel van de cursus is taak gestuurd ingericht, met een cyclus van [deels interactieve] hoorcolleges, zelfstudie en oefenopgaven en een nabesprekking [plus verdere oefening] tijdens werkcolleges. Elke week staat een bepaald thema centraal.

De ervaring is, dat de studenten die op een goede manier aan de slag gaan met zelfstudie en de oefenopgaven serieus maken, weinig problemen hebben met het halen van toetsen en tentamen. Het vak is georganiseerd in een tweetal blokken, die echter niet geheel 'chronologisch' na elkaar komen (zie t.z.t. de gedetailleerde cursusplanning). Mocht je problemen ondervinden bij blok 1, dan biedt zo'n 2e blok de kans om een frisse herstart te maken.

Bij het college hoort een casus, die gedurende het gehele semester doorloopt, en gestructureerd is via deelopdrachten. Aan de casus(deel)opdrachten wordt in groepjes van 3 personen gewerkt.

Toetsvorm

De cursus is onderverdeeld in 2 blokken. Tijdens de cursus zijn voor elk blok een aantal toetsen. Het gemiddelde toetscijfer binnen zo'n blok levert een 'blokcijfer' op.

Het eindtentamen bestaat uit 2 onderdelen, elk onderdeel correspondeert met zo'n blok.

Bij een 'voldoende' gemiddelde beoordeling van je casusdeeluitwerkingen, kun je een voldoende 'blokcijfer' gebruiken als vrijstellend voor dat onderdeel van het eindtentamen (dit geldt niet voor het hertentamen).

Het is essentieel de wekelijkse oefenopdrachten te maken!

Vereiste voorkennis

geen.

Literatuur

Bij dit vak wordt materiaal verstrekt via het Blackboard.

Het collegedictaat staat daar in elektronische vorm.

Bijzonderheden

Deze cursus maakt deel uit van de Da Vinci reeks van cursussen.

Formeel Denken

Vakcode: **IPK001 6 ec**

eerste semester (NB: deze cursus begint twee weken later)

dr. F. Wiedijk
dr. E.M.G.M. Hubbers

Studielastverdeling

- 30 uur werkcollege
- 108 uur zelfstudie
- 30 uur hoorcollege

Inleiding

Dit is een introductiecursus in de mathematische logica en theoretische informatica. Allerlei onderwerpen uit deze vakgebieden worden kort geïntroduceerd. Tijdens de eerste helft van de cursus (propositielogica en predicaatelogica) bouwt dit op, maar daarna bestaat de cursus uit allerlei niet direct gerelateerde onderwerpen. De cursus is een directe voorbereiding op de cursus Beweren & Bewijzen.

Leerdoelen

Na afloop van de cursus kunnen de studenten:

- omgaan met de cognitieve stijl van de theoretische informatica
- natuurlijke taal vertalen in logische formules en omgekeerd zowel in propositielogica, predicaatelogica en modale logica
- informeel redeneren over geldigheid van formules in modellen in deze drie logica's
- de begrippen alfabet, woord, formele taal, en de basisoperaties op woorden en talen hanteren
- talen in verband brengen met reguliere expressies en contextvrije grammatica's
- talen in verband brengen met eindige automaten
- basisbegrippen uit de grafentheorie weten en toepassen
- binomiaalcoëfficiënten berekenen en toepassen
- functies met recursie definiëren, en eenvoudige stellingen met inductie bewijzen

Onderwerpen

Het college is verdeeld in vijf blokken:

- propositielogica
- predicaatelogica
- modale logica
- formele talen en eindige automaten
- discrete wiskunde

Alle blokken zijn ongeveer even lang.

Toelichting werkvormen

Het college bestaat uit vijf blokken die met de vijf onderwerpen en de vijf hoofdstukken van de syllabus corresponderen.

Iedere bijeenkomst bestaat uit een uur werkcollege gevuld door een uur hoorcollege, afgezien van de eerste en laatste bijeenkomst van één van de vijf blokken: de eerste bijeenkomst van elk blok is uitsluitend hoorcollege en de laatste bestaat uit een uur responsiecollege gevuld door een uur deeltoets.

Toetsvorm

Er zijn vijf niet verplichte deeltoetsen en er is een eindtentamen. De deeltoetsen tellen alleen mee als het gemiddelde hoger is dan het tentamencijfer. Voor de precieze berekening van het eindcijfer zie de website.

Studenten die Beweren & Bewijzen al hebben gehaald krijgen deels vrijstelling. Zie ook hiervoor de website.

Vereiste voorkennis

Middelbare school wiskunde.

Literatuur

Het college volgt een dictaat dat geschreven is door Herman Gevers e.a. Dit dictaat is in pdf vorm beschikbaar op de website.

Website

www.cs.ru.nl/~freak/courses/fd-2008

Bijzonderheden

Deze cursus wordt gevuld door studenten Informatiekunde, door HBO-doorstromers Informatiekunde en door studenten Kunstmatige Intelligentie.

Fysieke en Digitale Bouwkunde

Vakcode: IPK006 3 ec

eerste en derde kwartaal

dr. H. Wupper

Inleiding

- De fysieke bouwkunde kent het (beschermd) beroep van **Architect**. Een architect begrijpt wat de bouwheer wil en helpt hem, nog beter te zien wat hij wil, draagt ook alternatieven aan, maakt een ontwerp, vaak zo grensverlegend als het de boewheer zelf niet zou kunnen, vertegenwoordigt de bouwheer tegenover de aannemer, etc. etc.
- Een architect heeft een brede opleiding:
 - Communicatie,
 - Materiaalkunde,
 - Ontwerp,
 - Vormgeving,
 - De menselijke maat
 - Theorie,
 - Architectuurgeschiedenis,
 - Modelleren.
- De opleiding informatiekunde is de "digitale" tegenhanger van de opleiding tot architect. Een academisch informatikundige zou best "architect in de digitale wereld" genoemd kunnen worden.
- Dat betekent dat informatiekundestudenten veel kunnen afkijken van de fysieke architectuur
 - zowel van gebouwen (hier kan men veel ook voor informatiekunde relevante dingen gewoon samen *bekijken* en voelen)
 - als van het vak van de architect.

Leerdoelen

- Uitleggen wat een "digitaal architect" doet aan de hand van analogieën met de fysieke architectuur
- Integraal kijken
- Rekenen houden met de menselijke maat bij IT-ontwerpen
- Ervaringen uit de fysieke architectuur toepassen in de IT-wereld

Onderwerpen

- Ontwerp vanuit verschillende gezichtspunten
- Vormgeving
- De menselijke maat
- Architectuurgeschiedenis
- Modelleren

Toelichting werkvormen

Een mix van colleges, demonstraties, gesprekken en excursies, n.t.b. in de loop van de cursus.

Toetsvorm

Werkstuk en presentatie

Vereiste voorkennis

Open blik en een zekere nieuwsgierigheid voor dingen die op het eerste gezicht misschien niets met IT te maken hebben.

Literatuur

Elke deelnemer wordt geacht een aantal boeken over architecten en architectuurstromingen te bezitten. De Slegte heeft altijd interessante architectuurboeken voor een zachte prijs. Het komt niet aan op specifieke boeken, architecten, stromingen. Het doel is dat je een beeld hebt van fysieke architectuur.

Website

lab.cs.ru.nl/algemeen/Architectuur

Bijzonderheden

Deze cursus wordt in studiejaar 2008-2009 tweemaal gegeven:

- in het najaar (eerste kwartaal), voor studenten van cohort 2006, 2007 en HBO-doorstromers die in september begonnen zijn;
- in het voorjaar (derde kwartaal), voor studenten van cohort 2008 en HBO-doorstromers die in februari begonnen zijn.

Modelleren van Bedrijfsprocessen

Vakcode: IPK007 3 ec

vierde kwartaal

Inleiding

In deze cursus krijgen de studenten inzicht in de organisatievormen en de manieren waarop bedrijfsprocessen gemodelleerd kunnen worden.

Leerdoelen

Na afloop van de cursus is de student in staat om:

- een bedrijfsprocesmodel op te stellen
- de correctheid van een procesmodel te argumenteren
- mee te denken over mogelijke prestatie-bevorderende verbeteringen in het model en indien voor de hand liggend die ook zelf voor te stellen
- de eerste transformatiestappen te zetten om te komen van een bedrijfsprocesmodel naar een ondersteunend informatiesysteem.

Onderwerpen

Onderwerpen die aan bod zullen komen hebben betrekking op:

1. bedrijfsprocessen; informationele, organisatorische, personele en sociale aspecten;
2. analyse van werkstromen
3. procesmodelleringsaspecten (o.a. 'volgorde taken');
4. procesmodelleringstechnieken (o.a. via 'Petri-netten', BPMN, procesalgebra);
5. analyse van bedrijfsprocesmodellen: validatie, verificatie en prestatie-analyse;
6. van AS-IS naar TO-BE modellen; 'improvement' versus 'reengineering';
7. eisen aan ondersteunende informatiesystemen (routering, toestanden);
8. mapping naar UML en verdere implementatie-stappen

Toelichting werkvormen

Naast de theorie is er een (kleine) casus opgenomen met 2 stappen, zodat tussendoor feedback mogelijk is:

1. analyseer de bestaande werkstromen, maak een bedrijfsprocesmodel, voer een analyse uit op dit model en stel verbeteringen voor.
2. mapping naar UML en verdere implementatie/stappen

Toetsvorm

Naast een (kleine) casus, wordt de cursus getoetst via een tentamen.

Vereiste voorkennis

Domeinmodellering

Onderzoeksmethoden

Vakcode: **I00150 3 ec**

eerste semester

dr. E. Barendsen

Studielastverdeling

- 6 uur werkcollege
- 24 uur hoorcollege
- 30 uur zelfstudie
- 4 uur responsie-college
- 20 uur projectwerk

Inleiding

Deze cursus gaat over het voorbereiden en het uitvoeren van onderzoek. We vatten de term 'onderzoek' daarbij breed op:

- problemen signaleren, analyseren en oplossen
- aan de hand van een precies geformuleerde *onderzoeks vraag*
- uitgevoerd met verantwoorde *methoden*
- zodanig dat het resultaat betrouwbaar is.

Wat is wetenschappelijk onderzoek? Hoe kom je van een vaag probleem tot een goede onderzoeks vraag? Hoe werkt de wetenschappelijke wereld? Aan de hand van deze vragen gaan we in deze cursus samen op verkenning.

We werpen een kritische blik op voorbeelden van onderzoek en verslaggeving daarover in de media. Je leert eigen onderzoek op te zetten en enkele veelgebruikte methoden toe te passen.

Leerdoelen

Na afloop van deze cursus kunnen de deelnemers:

- onderzoeks vragen formuleren;
- operationaliseren; onderzoeks modellen (theoretisch, empirisch) opstellen;
- professionele criteria aangeven voor ontwerp en uitvoering van onderzoek; deze criteria toetsen in praktijksituaties; kritisch reflecteren op (publicaties over) onderzoek;
- veelgebruikte methoden voor dataverzameling beschrijven, aangeven in welke situaties ze toepasbaar zijn en hoe valkuilen te vermijden zijn;
- vragenlijsten, interviews en experimenten opzetten en evalueren;
- methoden voor kwalitatieve en kwantitatieve analyse karakteriseren;
- literatuur zoeken met professionele hulpmiddelen, literatuur beschrijvingen opstellen;
- een onderzoeksplan opstellen volgens een professioneel format.

Onderwerpen

- Inleiding: criteria voor onderzoeks vragen, criteria voor de uitvoering van onderzoek, validiteit, betrouwbaarheid
- Onderzoeks ontwerp: onderzoeks functie, onderzoeks modellen, theoretisch, empirisch, onderzoeks plan, professionele standaarden
- Wetenschap: de wetenschappelijke wereld, mores, publicaties, literatuur zoeken, bibliotheek, wetenschaps filosofie
- Onderzoeks structuur: deel vragen, conceptuele modellen
- Operationaliseren: onderzoekseenheden, variabelen, meet niveaus, indicatoren, steekproef kaders, selectie van onderzoekseenheden, externe validiteit, interne validiteit, validiteit van causale verbanden

- Vragenlijsten en interviewen: enquêtes, interviewstructuur
- Experimenten: experimentele opzet, schema's, storende factoren
- Data-analyse: kwalitatieve (tekst)analyse, kwantitatieve analyse

Toelichting werkvormen

Een deel van de cursus is taakgestuurd ingericht, met een cyclus van oriëntatie (hoorcolleges), oefening en zelfstudie (casusbesprekingen en leertaken) en nabespreking (responsiecolleges). Verder werk je in de loop van de cursus aan een onderzoeksplan.

De nabespreking van leertaken is een belangrijke gelegenheid om feedback te krijgen op je werk en ideeën. Daarnaast krijg je regelmatig individueel commentaar op (deel)producten die leiden tot je onderzoeksplan. Je levert een bijdrage aan deze feedback aan medestudenten, waarbij je oefent met de professionele wetenschappelijke criteria.

Toetsvorm

De toetsing bestaat uit:

- een toets over de onderdelen onderzoeksontwerp, wetenschap (literatuur), onderzoeksstructuur, operationaliseren;
- je onderzoeksplan;
- een deeltentamen over de onderdelen wetenschap (behalve literatuur), vragenlijsten en interviewen, experimenten en data-analyse.

Om voor beoordeling in aanmerking te komen, moet je voor de toets een voldoende resultaat hebben behaald en hebben meegedaan aan de feedbackronden. Het eindcijfer wordt bepaald aan de hand van de beoordelingen voor het onderzoeksplan en het deeltentamen.

Vereiste voorkennis

De studenten kunnen:

- schriftelijk en mondeling helder formuleren;
- teksten schrijven in adequaat Nederlands;
- elementen van de taal van propositionele logica herkennen in natuurlijke taal (zoals in de cursus *Formeel denken* en de cursus *Beweren & bewijzen*);
- redeneerpatronen onderscheiden (zoals in de cursus *Beweren & bewijzen*).

Literatuur

- Essentieel: J. Segers, *Methoden voor de maatschappijwetenschappen*, Van Gorcum, Assen, 2002, ISBN 90-2323-341-7
- Aanbevolen: H. Oost en A. Markenhof, *Een onderzoek voorbereiden*, HB uitgevers, Baarn, 2002, ISBN 90-5574-376-3

Website

lab.cs.ru.nl/algemeen/Onderzoeksmethoden

Requirements Engineering

Vakcode: **IBK002 6 ec** eerste semester (NB. Deze cursus dr. S.J.B.A. Hoppenbrouwers begint twee weken later)

Studielastverdeling

- 72 uur zelfstudie
- 6 uur individuele begeleiding
- 40 uur projectwerk
- 20 uur groepsgewijs college
- 30 uur hoorcollege

Inleiding

Een inleiding in de "Requirements Engineering" (RE): een kernactiviteit in systeemontwikkeling die neerkomt op het vergaren en zorgvuldig specificeren van de eisen en verwachtingen die diverse stakeholders (opdrachtgevers, toekomstige gebruikers) hebben met betrekking tot een te bouwen informatiesysteem. We bestuderen en oefenen een methodiek waarin Use Cases centraal staan, maar waarbij diverse informele en formele modellen en beschrijvingen integraal worden opgesteld. Daarbij spelen bijv. ook conceptuele domeinmodellen en Business Rules een rol. Een uitgebreide projectcasus maakt deel uit van de cursus.

Leerdoelen

Na afloop van de cursus kunnen de deelnemers:

- Requirements vergaren en geordend specificeren
- Goed kwaliteit requirements integraal formuleren middels een aantal technieken, waaronder use cases, scenarios, domeinmodellen, business rules.
- Projectmatig omgaan met het proces van RE
- Reflecteren op RE in zowel theoretische als toegepaste zin, en in context van systeemontwikkeling als geheel.

Onderwerpen

- Wat zijn requirements (why-what-how van een systeem; functioneel and non-functioneel)
- Requirements vergaren
- Specificeren van requirements
- Fasering en planning in RE
- Use Cases
- Scenarios
- Business rules
- Domeinmodellen
- Stakeholder Analyse
- Requirements en taal
- RE in de praktijk

Toelichting werkvormen

Er zijn reguliere colleges en daarnaast een groot project (groepsgewijs). In het begin, voor het project uit, zijn er nog enkele werkcolleges.

De hoorcolleges (inclusief enige gastcolleges) behandelen het vaste leerboek van de cursus, maar ook een aantal uitbreidingen daarop. Al met al wordt een aantal integrale beschrijvingen en modellen aangeboden en uitgelegd, en daarnaast een uitgebreide werkwijze, alsmede de filosofie daarachter.

Het project wordt gecommuniceerd via de elektronische werkplaats. Het bestaat uit drie fases (iteraties). Er wordt altijd een semi-realistische casus gedaan: de requirements van een heus informatiesysteem met een echte "opdrachtgever", alleen niet in een commerciële setting. Het project wordt afgesloten met een rapport en een presentatie.

Toetsvorm

Deelnemers doen een schriftelijk examen (open vragen), maar het project telt ook zwaar mee: zwaarder zelfs dan het schriftelijk.

Vereiste voorkennis

Propedeuse Informatiekunde, met nadruk op de cursus domeinmodelleren. Voor schakelvakkers: een vorm van conceptueel modelleren, bijv. FCO-IM, ORM, of ER. UML kennis is ook handig, m.n. Use Cases en Class Diagrams. Er wordt in ieder geval basiskennis verwacht van het algemene proces van systeemontwikkeling.

Literatuur

Centraal staat het leerboek "Use Cases - requirements in context" (Kulak en Guiney, 2003; 2nd edition; Addison-Wesley; ISBN 0-321-15498-3). Dit is verplichte literatuur. Overig materiaal (o.a. een syllabus) wordt digitaal aangeboden via de website.

Website

www.niij.ru.nl/~stijnh/re/Overview2008-2009.html

Security

Course ID: **IBI002** 6 ec

first semester

prof. dr. B.P.F. Jacobs

dr. O. Shkaravská

F.D. Garcia

Study investment

- 32 hrs lecture
- 32 hrs problem session
- 104 hrs individual study

Introduction

Security is widely recognized as being of great importance in all areas of information technology: networks, operating systems, databases etc. Security is about regulating access to assets. Crucial questions are: Who are you? and: Should you be doing that? Authentication (of people and computers) and access control are basic aspects of computer security. Cryptography provides a mathematical toolset for realising key security goals, via appropriate protocols. This bachelor lecture introduces the basics of computer security, both for computer science and information science students.

Objectives

At the end of this course:

1. You are able to recognise -- in society in general and within a job environment in particular -- situations in which information security plays a role.
2. You are able to recognise relevant security goals in such situations (confidentiality, integrity, availability, authenticity, non-repudiation, accountability).
3. You can (on a global level) describe basic techniques to achieve these security goals, evaluate existing solutions, and propose new solutions in practical situations.
4. You recognise the social and organisational implications of security technologies (especially privacy), and you can take these aspects into account in your analysis of practical situations.

Subjects

- Elementary cryptography
- Symmetric key encryption
- Public key encryption
- Digital signatures
- Management of public keys
- Communication security
- Authentication protocols
- E-mail security
- Web security
- Social issues

Teaching methods

Lectures start in week 36. The first exercise course (E1) on 1/9/'08 is skipped; the first lecture (L1) starts Friday morning, 5/9/'08, 8:45-10:30. Hence the first exercise course will be on Monday morning 8/9/'08, when some further organisational issues will be discussed. The following scheme is foreseen for the issuance and return of exercises. Exercises appear each week on the web on Wednesdays. You can ask questions individually about them at the next exercise course on Monday; you have to hand them in one week after issuance on Thursday morning before 9:00. Marked copies will be returned and solutions will be discussed in the next exercise course on Monday.

Exercises may be done in pairs. Your solution has to be handed in *on paper* before the deadline, at in the mailbox of your exercise course teacher (Ohla or Flavio) on the 2nd floor of the Huygens building. Exercises not handed in in time will be graded 1; submission by e-mail or Blackboard is *not* accepted. Copying or stealing work from others or from the Web will result in all involved parties failing the course *and* notification of the exam committee, so make sure we don't discover anything if you copy yourself, and secure your own work against copying by others.

Examination

The examination will be based on the outcome of both the exercises and the written exams. There are two exams (midterm and final); the average of these exams will be used below. If both parts (exercises and exam) of the examination have been completed in time, the final mark will be the average of the two, provided the outcome of the exams is at least 5.0. If the result of the exam is lower than 5.0, the final mark will be equal to this result. You are *not* allowed to bring books or notes to the written exams. The grade for the exercises is valid until the first retry exam. If you do not finish the course within this academic year, you will have to do the exercise course again next year.

Prerequisites

Basic knowledge of computer science and mathematics (esp. algebra).

Literature

Compulsory:

- Chapter 8 *Network Security* from: A.S. Tanenbaum, Computer Networks, fourth ed. Prentice Hall, 2003. The same book will be used for the course *Geheugen, distributie en netwerken*, so that students who also follow that course are well-advised to buy the book. It is certainly a valuable book to have, even if only one chapter is used for Security. But a copy of chapter 8 is enough to follow the course. Getting such copies is not organised by the institute (nor by the lecturers).
- Course material by David Aspinall.

Website

www.ru.nl/ds/teaching/course_sites/security_2008

4 Appendices

4.1 Calendar 2008-2009

Academic year

September 1st 2008 - August 31 2009

Semester

Fall semester: 1 September 2008 - Friday 30 January 2009;

Spring semester: 2 February - 10 July 2009

Holiday(s)

During holidays there are no lectures, but it is possible that exams and preliminaries are scheduled during holidays. For more information you may consult the schedule below.

Holiday	Date	Lectures	Preliminaries ("tentamens")	Final exams
Start academic year	afternoon 01-09-08	-	-	-
Fall Break*	13-10-08 / 17-10-08			
Christmas holidays	22-12-08 / 02-01-09	-	-	-
Carnival	23-02-09 / 27-02-09	-	+	-
Eastern	10-04-09 / 13-4-09	-	-	-
May holiday	27-04-09 / 05-05-09	-	+	-
Queen's Birthday	30-04-09	-	-	-
Liberation Day	05-05-09	-	-	-
Foundation Day	14-05-09	-	-	-
Ascension day	21-05-09	-	-	-
day after Ascension day	22-05-09	-	-	-
Whitsun	1-06-09	-	-	-
Summer holidays	13-07-09 / 28-08-09 13-07-09 / 07-08-09 10-08-09 / 21-08-09 24-08-09 / 28-08-09	- - - -	- + + +	- - - +

Quarters

Quarter 1:	01-09-08 till 07-11-08
Quarter 2:	10-11-08 till 30-01-09
Quarter 3:	02-02-09 till 17-04-09
Quarter 4:	20-04-09 till 10-07-09

* Fall break: this break applies for this faculty but is not a general holiday for the Radboud University

4.2 Important names and addresses

Faculty of Sciences

Heyendaalseweg 135, 6525 AJ Nijmegen
Huygens building
tel.: 024-3616161 (Radboud University - general phone nr.)

Education Bureau for Computing and Information Sciences

General

- Secretary's office: HG02.540, Huygens building
tel.: 024-3652084

Staff

- *Ms. Resi Westerman, MA*, pr/secretary; R.Westerman@cs.ru.nl
- *Ms. Marcha Jelissen, MA* pr/secretary; M.Jelissen@cs.ru.nl
- *Ms. Vera Kamphuis, MA*, head, coordinator of studies of Information Science; V.Kamphuis@cs.ru.nl
- *Ms. Yella Kleijnen*, coordinator of studies of Computing Science; Y.Kleijnen@cs.ru.nl

Student advisor for Master students

- *dr. Theo Schouten*, T.Schouten@cs.ru.nl

Student advisor for "HBO-instromers" (post-Polytechnic bachelor students)

- *Dr. Hanno Wupper*, H.Wupper@cs.ru.nl

Master's thesis coordinator

- *Dr. Patrick van Bommel*, pvb@cs.ru.nl
website: www.cs.ru.nl/mlt/

Education Board

- *Dr. Erik Barendsen*, director; E.Barendsen@cs.ru.nl
- *Dr. Sjaak Smetsers*, coordinator master programme Computing Science; S.Smetsers@cs.ru.nl
- *Prof.dr.Th.P.van der Weide*, coordinator master programme Information Science; Th.P.vanderweide@cs.ru.nl
- *Freek van den Berg*, studentassessor; FvandenBerg@student.ru.nl
- *Ms. Vera Kamphuis, MA*, head of the education office; V.Kamphuis@cs.ru.nl
- *Ms. Yella Kleijnen*, secretary, Y.Kleijnen@cs.ru.nl

Education Committee of Computing Science and Information Science

Members of this committee are 4 students in computing science, 4 students in information science and 4 lecturers.

- *Drs. Ger Paulussen*, chairman; G.Paulussen@cs.ru.nl
- *Ms. Yella Kleijnen*; secretary; Y.Kleijnen@cs.ru.nl

Examination Board

- *Dr. Marko van Eekelen*, chairman; M.vanEekelen@cs.ru.nl
- *Dr. Dick van Leijenhorst*, vice-chairman; D.vanLeijenhorst@cs.ru.nl
- *Dr. Theo Schouten*, secretary; T.Schouten@cs.ru.nl

General e-mail account: examencommissie@niii.ru.nl

Website: www.cs.ru.nl/examencommissie/index.html

Coordinator of international affairs for Computing and Information sciences

- *Prof.dr. Th.P.van der Weide*, Th.P.vanderweide@cs.ru.nl

Office of administration and exams for science students (FSA)

- Ms. Clementine Hendriks, Ms. Yvonne Mulder,
opening hours: Monday to Thursday: 13-16 hrs, Friday: 9-12 hrs
room: HG00.134, Huygens building
tel.: 024-3652247/024-3653392

Central student affairs office

- Comeniuslaan 4, Nijmegen
tel.: 024-3612345
webpage: www.ru.nl/students
See the 'Vademecum' for more information.

Students' association Thalia**(for students of Computing Science or Information Science)**

- info@thalia.nu (general info)
website: www.thalia.nu

Alumni association Ninja (for Computing and Information Sciences)

- Contact: dr. Dick van Leijenhorst, D.vanLeijenhorst@cs.ru.nl
website: www.cs.ru.nl/ninja

4.3 Procedure for "Schakelverklaringen"

This information is intended for students who enter the master programme on the basis of a Bachelor's degree from a Polytechnic ("HBO-doorstromers"). Such students need to complete a set of courses from the bachelor programme covering their deficiencies (transition programma or in Dutch "schakelprogramma") before being able to register as master students.

For reasons of planning, the courses of the deficiency programme are intertwined with the courses of the master programme, which means that you are in fact allowed to take part in a few basic courses of the master programme before actually completing the deficiency programme. However, *you are not entitled to start work on your master's thesis until you have completed your "schakelprogramma" and are officially registered as master student*. In order to register as master student, you need to obtain a so-called "Schakelverklaring" from the Education bureau. Here's how (in view of the fact that HBO-doorstromers are usually Dutch, we shall describe this in Dutch below).

Procedure voor schakelverklaringen

1. Je levert bij het onderwijsbureau de volgende gegevens in:
 - naam-, ru-email-, adres- en opleidingsgegevens.
 - Het bewijs dat je ingeschreven staat voor de bacheloropleiding Informatica. Daarvoor lever je een kopie van je collegekaart in.
 - Een uitdraai van je cijferlijst. Deze vraag je op bij de facultaire studentenadministratie (HG0.134) en is voorzien van handtekening en stempel van de FSA (openingstijden ma-do: 13-16 uur, vrij 9-12 uur). Geef zelf even aan om welke cursussen het gaat (aanvinken of markeren met stift).
 - Je kunt je gegevens inleveren bij het onderwijsbureau. Als er niemand aanwezig is dan kun je je gegevens in de houten inleverbak doen. Het wijst zich vanzelf welke dat is.
2. Het onderwijsbureau controleert je gegevens, overlegt met de examencommissie en bereidt de verklaring voor.
3. Je krijgt de verklaring binnen twee weken thuis gestuurd.
4. Met deze verklaring moet je zelf bij de centrale studentenadministratie (Comeniuslaan 4) je inschrijving omzetten. **JE KUNT PAS MET JE AFSTUDEREN BEGINNEN ALS INSCHRIJVING IS OMGEZET EN JE ALS MASTERSTUDENT STAAT GEREGSTREERD.**

4.4 List of lecturers

Name	E-mail	Phone (024-36 ...)	Room
Barendsen, Dr. E.	e.barendsen@cs.ru.nl	52646	HG 02.625
Berendsen, Ir. J.K.	j.berendsen@cs.ru.nl	53147	HG 03.628
Bommel, Dr. P. van	p.vanbommel@cs.ru.nl	52645	HG 02.611
Brinkman, Dr. ir. R.	r.brinkman@cs.ru.nl	52713	HG 02.061
Carvalho Ferreira, Dr. N.	nivea@cs.ru.nl	52104	HG 02.620
Consoli, Dr. L.	l.consoli@science.ru.nl	53065	HG 02.824
Garcia, F.D.	f.garcia@cs.ru.nl	52599	HG 02.049
Geuvers, Prof. dr. J.H.	herman@cs.ru.nl	52603	HG 02.526
Hommersom, Dr. A.J.	arjenh@cs.ru.nl	52104	HG 02.618
Hoppenbrouwers, Dr. S.J.B.A.	stijnh@cs.ru.nl	52645	HG 02.611
Hubbers, Dr. E.M.G.M.	e.hubbers@cs.ru.nl	52713	HG 02.061
Jacobs, Prof. dr. B.P.F.	b.jacobs@cs.ru.nl	52236	HG 02.076
Lucas, Dr. P.J.F.	peterl@cs.ru.nl	52611	HG 02.614
McKinna, Dr. J.H.	j.mckinna@cs.ru.nl	52610	HG 02.514
Paulussen, Drs. G.F.M.	g.paulussen@cs.ru.nl	52509	HG 02.068
Proper, Prof. dr. H.A.	e.proper@cs.ru.nl	53175	HG 02.609
Rossum, Drs. P.J.B. van	petervr@letterboxes.org	52077	HG 02.069
Sarbo, Dr. J.J.	janos@cs.ru.nl	53049	HG 02.513
Schouten, Dr. T.E.	t.schouten@cs.ru.nl	53175	HG 02.609
Shkaravska, Dr. O.	shkarav@cs.ru.nl	52217	HG 02.071
Vliet, Prof. dr. M. van	m.vanvliet@cs.ru.nl	53175	HG 02.609
Weide, Prof. dr. ir. T.P. van der	th.p.vanderweide@cs.ru.nl	53361	HG 06.621
Wiedijk, Dr. F.	freek@cs.ru.nl	52649	HG 02.512
Wupper, Dr. H.	hanno.wupper@cs.ru.nl	52227	HG 02.613

Index of courses

Beweren en Bewijzen.....	35
Business Rules.....	11
Capita Selecta Information Science.....	12
Cognition and Representation.....	25
Computational Intelligence.....	27
Domeinmodellering.....	38
Formeel Denken.....	40
Foundations of Information Systems.....	29
Fysieke en Digitale Bouwkunde.....	42
ICT in a different culture.....	31
Informatics and Society 2.....	13
Information Retrieval.....	33
Master's thesis in Information Science.....	14
Modelleren van Bedrijfsprocessen.....	44
Onderzoeksmethoden.....	45
R&D: Research 2.....	17
R&D: System Development Management 1.....	19
R&D: System Development Management 2.....	21
Requirements Engineering.....	47
Research methods (master course).....	15
Security.....	49
Security in organisations.....	23