



## Information Sciences MSc

Vrije Universiteit Amsterdam - Faculteit der Exacte Wetenschappen - M Information Sciences - 2015-2016

The Master's in Information Sciences trains you to become an outstanding professional who is capable of independent and team problem solving with regard to the design, application and practical use of complex information systems in organizations.

The program is given in collaboration with the UvA program "Information Studies". This UvA master program admits students with a similar bachelor as the VU IMM bachelor.

The program is set up in such a way that you can still follow the majority of the courses at the VU, if you prefer. VU and UvA courses are scheduled on different weekdays, to prevent travel overhead.

Information Sciences is the multidisciplinary area bridging Information and Communication Technology (ICT) and its practical use in society. Are you interested in how information is created and processed in companies and institutions? Are you more interested in the application of technology than technology for its own sake? Do you believe it's important not to lose sight of the role people, organizations and cultures play in designing, modelling, communicating and sharing information? Are you fascinated by knowledge and innovation? If so, then the Master's programme in Information Sciences at VU Amsterdam is an excellent choice for you.

Information Sciences (IS, in other countries also called Information Systems) focus on theory development and best practices of effective creation, structuring, processing, communication and sharing of information and knowledge using ICT. Information processes and contexts of organizations and individuals are studied, not just from a technological perspective but also from the social, economic, cognitive and organizational perspectives.

At VU we pay special attention to the latest innovative developments and applications of ICT, related to Internet, World Wide Web, multimedia, intelligent systems, and electronic business. Here are some of the advanced topics that IS researchers at VU currently investigate:

- How can you make the World Wide Web intelligent so that it becomes much more easy to represent, process and share electronic information and knowledge across companies and communities of interest?
- How do you design multimedia databases for broad user groups on the Internet on, say, some pop music style or museum art collection, including videoclips, sound samples, explanatory notes, and an easily searchable discography or collection overview?
- What are successful networked business models for small and medium-sized enterprises to offer e-services over the Web, for example for sustainable and cost-effective energy management in smart buildings, or electronic support for medical and elderly care at home? Information Sciences at the Vrije Universiteit strikes a healthy balance by combining technology and information with the study of people, culture and organizations. It builds on a solid computer science foundation, but does so in an inherently multidisciplinary approach that continuously crosses and challenges the boundaries between exact and social sciences. Our research is at the international forefront, an achievement directly reflected in the Master's program. Social, communicative and managerial skills are important in IS. So, during your study you will regularly work in project teams and collaborate with others to solve practical problems regarding complex information systems in real-life settings.

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# Business Information Systems

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- [Compulsory Courses](#)

## Limited offered course

This course is taught this year only at our University. Philippe Kruchten is Professor of Software Engineering at the University of British Columbia in Vancouver. He is world-famous as the chief designer of the Rational Unified Process (RUP) and currently he is doing research on Agile Architectures. He will give this course specially for our Master Computer Science and Master Information Sciences students.

Vakken:

| Naam                              | Periode   | Credits | Code     |
|-----------------------------------|-----------|---------|----------|
| <a href="#">Watson Innovation</a> | Periode 2 | 6.0     | X_405129 |

## Constrained choice period 4(6 EC)

Vakken:

| Naam                                       | Periode   | Credits | Code     |
|--|-----------|---------|----------|
| <a href="#">Business Process Analytics</a> | Periode 4 | 6.0     | X_400650 |
| <a href="#">Information Visualization</a>  | Periode 4 | 6.0     | X_418143 |
| <a href="#">The Social Web</a>             | Periode 4 | 6.0     | X_405086 |

## Constrained choice period 2 (6 EC)

Vakken:

| Naam  | Periode   | Credits | Code     |
|---|-----------|---------|----------|
| <a href="#">Digital Innovation: New Ways of Organizing and Working"</a> | Periode 2 | 6.0     | X_400653 |
| <a href="#">Software Architecture</a>                                   | Periode 2 | 6.0     | X_400170 |

## Suggested elective courses

Vakken:

| Naam  | Periode   | Credits | Code        |
|---|-----------|---------|-------------|
| <a href="#">E-Commerce Law</a>  | Periode 5 | 6.0     | R_E.commerc |
| <a href="#">ICT4D: Information and communication technology for Development</a> | Periode 5 | 6.0     | X_405101    |
| <a href="#">Serious Games</a>   | Periode 5 | 6.0     | X_405097    |

## Compulsory Courses

Vakken:

| Naam  | Periode              | Credits | Code     |
|---|----------------------|---------|----------|
| <a href="#">Business Process Management</a>                   | Periode 1            | 6.0     | X_405115 |
| <a href="#">Interdisciplinary Research Methodology for IS</a> | Periode 2            | 6.0     | X_405085 |
| <a href="#">Master Project Information Sciences</a>           | Ac. Jaar (september) | 18.0    | X_405083 |
| <a href="#">Service Oriented Design</a>                       | Periode 1            | 6.0     | X_405061 |
| <a href="#">Thesis Design</a>                                 | Periode 3            | 6.0     | X_405087 |

## Web & Media

Opleidingsdelen:

- [Limited offered course](#)
- [Constrained choice period 4 \(6 EC\)](#)
- [Constrained choice period 2 \(6 EC\)](#)
- [Suggested elective courses](#)
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## Limited offered course

This course is taught this year only at our University. Philippe Kruchten is Professor of Software Engineering at the University of British Columbia in Vancouver. He is world-famous as the chief designer of the Rational Unified Process (RUP) and currently he is doing research on Agile Architectures. He will give this course specially for our Master Computer Science and Master Information Sciences students.

Vakken:

| Naam | Periode | Credits | Code |
|------|---------|---------|------|
|------|---------|---------|------|

|                                   |           |     |          |
|-----------------------------------|-----------|-----|----------|
| <a href="#">Watson Innovation</a> | Periode 2 | 6.0 | X_405129 |
|-----------------------------------|-----------|-----|----------|

## Constrained choice period 4 (6 EC)

Vakken:

| Naam                                      | Periode   | Credits | Code     |
|---|-----------|---------|----------|
| <a href="#">Information Visualization</a> | Periode 4 | 6.0     | X_418143 |
| <a href="#">Mobile Systems</a>            | Periode 4 | 6.0     | X_418068 |
| <a href="#">The Social Web</a>            | Periode 4 | 6.0     | X_405086 |
| <a href="#">Web Search</a>                | Periode 4 | 6.0     | X_418130 |

## Constrained choice period 2 (6 EC)

Vakken:

| Naam                                  | Periode     | Credits | Code     |
|---------------------------------------|-------------|---------|----------|
| <a href="#">Knowledge Engineering</a> | Periode 2+3 | 6.0     | X_405099 |
| <a href="#">Software Architecture</a> | Periode 2   | 6.0     | X_400170 |
| <a href="#">Visual Search Engines</a> | Periode 2   | 6.0     | X_417016 |

## Suggested elective courses

Vakken:

| Naam  | Periode   | Credits | Code        |
|---|-----------|---------|-------------|
| <a href="#">E-Commerce Law</a>  | Periode 5 | 6.0     | R_E.commerc |
| <a href="#">ICT4D: Information and communication technology for Development</a> | Periode 5 | 6.0     | X_405101    |
| <a href="#">Serious Games</a>   | Periode 5 | 6.0     | X_405097    |

## Compulsory courses

Vakken:

| Naam  | Periode   | Credits | Code     |
|---|-----------|---------|----------|
| <a href="#">Intelligent Interactive Systems</a>               | Periode 1 | 6.0     | X_418023 |
| <a href="#">Interdisciplinary Research Methodology for IS</a> | Periode 2 | 6.0     | X_405085 |
| <a href="#">Knowledge and Media</a>                           | Periode 1 | 6.0     | X_405065 |

|                                     |                      |      |          |
|-------------------------------------|----------------------|------|----------|
| Master Project Information Sciences | Ac. Jaar (september) | 18.0 | X_405083 |
| Thesis Design                       | Periode 3            | 6.0  | X_405087 |

## Business Process Analytics

|                      |                                    |
|----------------------|------------------------------------|
| <b>Vakcode</b>       | X_400650 ()                        |
| <b>Periode</b>       | Periode 4                          |
| <b>Credits</b>       | 6.0                                |
| <b>Voertaal</b>      | Engels                             |
| <b>Faculteit</b>     | Faculteit der Exacte Wetenschappen |
| <b>Coördinator</b>   | dr. H. Leopold MSc                 |
| <b>Examinator</b>    | dr. H. Leopold MSc                 |
| <b>Docent(en)</b>    | dr. H. Leopold MSc                 |
| <b>Lesmethode(n)</b> | Hoorcollege, Practicum             |
| <b>Niveau</b>        | 400                                |

### Doel vak

After taking this course, the student will:

- be aware of the current possibilities to support BPM with information technology.
- understand and be able to employ process mining techniques for the purpose of process discovery, compliance checking, and improvement.
- know key technologies for analyzing large process model repositories.
- know and be able to employ basic as well as advanced NLP techniques for the purpose of process analysis.
- know and be able to use process model simulation for testing and improving process design.

### Inhoud vak

There is a steadily increasing interest of organizations to use Business Process Management (BPM) for documenting and improving their operations. However, the associated manual effort for thoroughly eliciting, documenting, and updating process knowledge in the form of process models is often considerable.

Within this course, we put an emphasis on the technological and analytical perspective and discuss how they can support organizations in effectively and efficiently implementing BPM. In fact, techniques from the fields of information retrieval, data mining as well as simulation provide valuable foundations to reduce to the manual effort in the context of BPM. Hence, we introduce and discuss four different technological angles and demonstrate how each of these angles can strengthen the different phases of the BPM life cycle. In particular, we address the following technological areas:

1. Process Mining: The technology of process mining builds on the analysis of event logs that were generated by information or workflow systems. We discuss how process mining techniques can be used for process discovery, compliance checking, and improvement and elaborate on basic as well as advanced process mining algorithms. In addition, we introduce current process mining tools for the application of process mining in practice.

2. Process Model Collections: Many large organizations maintain process model repositories with several hundred process models. Hence, manual analysis efforts are time-consuming and cumbersome. Recognizing this, we introduce key concepts to automatically analyze process model collections. Among others, we discuss techniques for process model comparison, process model search, and behavioral analysis of process models.

3. Natural Language Analysis: The automated analysis of natural language, which is referred to as Natural Language Processing (NLP), has been applied in many contexts. As an example, consider Apple's Siri or Google's S Voice, which are capable of interpreting human speech. In fact, also organizations and their business processes may considerably benefit from natural language processing techniques. Hence, we introduce the key NLP techniques that are relevant in the context of BPM. Among others, we discuss techniques for process model content analysis, process model quality insurance, and identification of improvement potential in process models.

4. Simulation: The simulation of business processes is a tool that is used to predict performance and to understand the impact of change. It, for instance, allows organizations to test processes before they are actually technically implemented in a system. Due to its usefulness for organizations, we introduce the technological foundations for process simulation and give an overview of process simulation tools.

The various lectures and instructions will be devoted to these technological areas.

### **Onderwijsvorm**

There will be lectures as well as work instructions.

### **Toetsvorm**

The grading for students who follow this course in the scheduled period will be based on two grades:

1. The first grade is based on a number of home assignments. The goal of the assignments is to evaluate whether the students can successfully apply the content from the lecture. Among others, the students will be asked to mine a business process model from a given event log and to automatically infer relevant information using natural language processing tools from a given text.

2. The second grade is gained by participating in the regular exam during the exam week. The exam is a closed book exam, which consists of theoretical questions and small assignments. Selected chapters from the books "Fundamentals of Business Process Management", "Process Mining", and "Speech and Language Processing" will be the basis for this exam.

The overall result for this exam is the rounded, weighted average of the first grade (50%) and the second grade (50%) provided that both grades (unrounded) at least amount to a 5.00. If either of the grades is lower than a 5.00, the overall grade for this course is determined by the rounded, lowest grade of the two.

For all students who fail the course in the scheduled period or decide to follow the course outside this period, the course is graded solely by the grade for the re-exam. This is a full exam similar to the original



exam and the assignments. The re-exam is a closed book exam, too.

### Literatuur

1. Fundamentals of Business Process Management. Dumas, M., La Rosa, M., Mendling, J., Reijers, H.A. Springer, 2013. ISBN: 978-3-642-33142-8 (Print) 978-3-642-33143-5 (Online).
2. Process Mining. Discovery, Conformance and Enhancement of Business Processes. van der Aalst, Wil. Springer, 2011. ISBN: 978-3642193446.
3. Speech and Language Processing, Jurafsky, Dan, Martin, James H. Pearson International Edition, 2008. ISBN: 978-0135041963.

### Aanbevolen voorkennis

Students will, among others, benefit from the knowledge they acquired in the courses Information Management and Business Process Management. However, we aim at providing all necessary foundations within this course.

### Doelgroep

This is an interdisciplinary course. Any student who is interested in learning how technology can be used to improve business processes in practice is invited to join this course.

## Business Process Management

|                      |                                     |
|----------------------|-------------------------------------|
| <b>Vakcode</b>       | X_405115 ()                         |
| <b>Periode</b>       | Periode 1                           |
| <b>Credits</b>       | 6.0                                 |
| <b>Voertaal</b>      | Engels                              |
| <b>Faculteit</b>     | Faculteit der Exacte Wetenschappen  |
| <b>Coördinator</b>   | prof. dr. ir. H.A. Reijers          |
| <b>Examinator</b>    | prof. dr. ir. H.A. Reijers          |
| <b>Docent(en)</b>    | prof. dr. ir. H.A. Reijers          |
| <b>Lesmethode(n)</b> | Hoorcollege, Practicum, Werkcollege |
| <b>Niveau</b>        | 400                                 |

### Doel vak

Business Process Management is a rapidly growing field, both in practice and academia. Evidence from the effectiveness of process-oriented approaches is accumulating. Process-aware technologies are used by organizations in all areas of the world, in all sectors.

As an expert in Business Information Systems, it is inevitable that you will get involved in process improvement projects. In your career, you may find yourself in the role of a professional working in a process that is being analyzed, redesigned, or supported by information technology. Alternatively, you may be managing such a process. Even more likely, you may play the role of intermediary, standing between the operational professionals executing a process and higher management that wishes organizational improvement. The knowledge and especially the skills taught in this course provide you with the basic instruments to carry out and understand BPM projects.

This course also gives a view on the scientific challenges that the BPM

field is concerned with. This may stimulate you to contribute to the solutions for these challenges, for example as a scientist in this area.

After taking this course, the student will be able to:

- explain the organizational merits of process thinking, in particular in contrast to traditional management thinking;
- identify the different phases in the management of business processes;
- model complex business processes with a formal modeling technique, taking (partly) informal requirements into account;
- communicate process designs to both end-users and IT specialists;
- use process design theory to develop alternatives to existing processes;
- analyze the conformance and performance of process designs before they are put into production;
- understand how business processes can be analyzed on the basis of analyzing event logs;
- describe and understand the main features of process-aware information systems (workflow technology).

### **Inhoud vak**

As a response to increasing competition and more demanding customers, various researchers, practitioners, and management gurus have suggested companies to put less emphasis on hierarchical and functional structures, but instead focus on and improve entire chains of business operations, ranging often from client to client. The orientation on such business processes to manage and improve organizational effectiveness is at the core of this course.

Within this course, there is an emphasis on the role of models and information technology to manage business processes. This means that there will be a focus on the creation and analysis of design artifacts, in particular process models. Also, the role of IT as an enabling and support technology for process improvement will receive a wide share of attention.

The course on Business Process Management builds on the idea that business processes go through a life-cycle, with different phases:

- Identification: the problem to distinguish which processes in organizations require priority to be actively managed;
  - Discovery: the elicitation and specification of the way that operational processes are carried out;
  - Analysis: the understanding of a process' structural ability to fulfill the requirements it must meet;
  - Redesign: the planned actions to increase the performance and/or conformance of business processes by changing its elements;
  - Implementation: the execution of business processes using advanced IT, such as workflow management systems;
  - Monitoring/control: the day-to-day monitoring of a business process to detect operational problems and violations of regulations.
- The various lectures and instructions will be devoted to these phases.

### **Onderwijsvorm**

Three hours of lectures per week (h) and two hours of work instructions (w).

### **Toetsvorm**

Assignments (O) and a closed-book exam (T). The resit is one integrated, closed-book exam (T).

## Literatuur

Fundamentals of Business Process Management. Dumas, M., La Rosa, M., Mendling, J., Reijers, H.A. Springer, 2013. ISBN: 978-3-642-33142-8 (Print) 978-3-642-33143-5 (Online).

## Digital Innovation: New Ways of Organizing and Working"

|                      |                                    |
|----------------------|------------------------------------|
| <b>Vakcode</b>       | X_400653 ()                        |
| <b>Periode</b>       | Periode 2                          |
| <b>Credits</b>       | 6.0                                |
| <b>Voertaal</b>      | Engels                             |
| <b>Faculteit</b>     | Faculteit der Exacte Wetenschappen |
| <b>Coördinator</b>   | prof. dr. M.H. Huysman             |
| <b>Examinator</b>    | prof. dr. M.H. Huysman             |
| <b>Docent(en)</b>    | prof. dr. M.H. Huysman             |
| <b>Lesmethode(n)</b> | Hoorcollege                        |
| <b>Niveau</b>        | 400                                |

### Doel vak

The aim of this course is to develop a

critical academic attitude towards "New ways of working and organizing".

After successful completion, students will

have

- An advanced understanding of the new business environment and workplace practices enabled by digital technologies (Internet, mobile technologies, virtual worlds);
- An advanced understanding of how working, coordinating, and managing in this new environment is different from traditional workplace
- Being able to analyze the specific requirements of active, successful collaborations and organizing based on the opportunities that digital technologies offer.
- Developed an ability to challenge the technological deterministic perspective on new ways of working and organizing and on latest development in field of digital innovation.

### Inhoud vak

New ways of working and organizing refers to new ways in which knowledge workers

collaborate in increasingly distributed and flexible organizational contexts,

instigated by new technologies. These organizational changes come about as a result of an interplay between an increased importance of knowledge in organizations as well as the opportunities that many digital technologies offer. For example, personal mobile devices are increasingly

used for knowledge coordination and communication affording working in flexible

settings, like open internal and third offices. Furthermore, work is

increasingly being

done virtual and communication extends more and more to social media and calls for using expertise developed outside the formal boundaries, for example in networks and 'crowds'. The possible consequences of these

new ways of working and organizing are often predicted but not yet fully and

academically understood. Scholars from multiple disciplines, using

different methods and perspectives, are still developing this rising

field that also practitioners are trying to grasp. In this course, these different

aspects and theories related to new ways of working and organizing are discussed. In particular, we address these themes in relation to the emerging phenomenon of digital innovation. The course will start with the basics of 1) what is knowledge and how to share, integrate, coordinate and manage it; and 2) what is technology and how does it effect work and organizing. Subsequently, we discuss the emerging phenomenon of digital innovation as both a way to support organizational processes as well as the organizational implications of developing digital innovation products and services.

### **Onderwijsvorm**

The course consists of six lectures, five group assignments and an exam. Every week is dedicated to a particular topic. The five assignments will have to be made in groups of three to five students, as a follow-up of each lecture. The assignments concern a case study that has to be analyzed with the use of the articles that students need to read for that particular topic of the week (see schedule below). These assignments will be distributed separately.

Lecture 1 Knowledge and Organization;

Lecture 2 Socio technical perspective on work and organization;

Lecture 3 Mobility and new offices;

Lecture 4 Virtual work and networks;

Lecture 5 Organizing for Digital Innovation;

Lecture 6 Business Model Innovation

Each lecture introduces theoretical aspects of new ways of working and organizing, combined with illustrations from practice. At the end of each lectures, the assignment of the week will be introduced. To make the interactive lectures and understand the assignments, it is important to come to class prepared.

### **Toetsvorm**

The final grade will be determined by your average score for the five assignments (50%) and your individual score for the written exam (50%).

The written examination is based on the academic articles and the lectures.

### **Literatuur**

- Academic papers (these will be offered as links through Blackboard under 'Documents').

## **E-Commerce Law**

|                      |                                 |
|----------------------|---------------------------------|
| <b>Vakcode</b>       | R_E.commerc (200942)            |
| <b>Periode</b>       | Periode 5                       |
| <b>Credits</b>       | 6.0                             |
| <b>Voertaal</b>      | Engels                          |
| <b>Faculteit</b>     | Faculteit der Rechtsgeleerdheid |
| <b>Coördinator</b>   | prof. mr. A.R. Lodder           |
| <b>Examinator</b>    | prof. mr. A.R. Lodder           |
| <b>Docent(en)</b>    | prof. mr. A.R. Lodder           |
| <b>Lesmethode(n)</b> | Lezing, Werkgroep               |
| <b>Niveau</b>        | 500                             |

### **Doel vak**

The prime goal of the course is to obtain a general understanding of legal issues that occur when doing business online. The European Union directives related to electronic commerce are taken as a starting point in this course.

### **Inhoud vak**

E-commerce conducted between businesses is already quite successful, and so is consumer e-commerce. Current legislation has been drafted for a paper-based society. For the information society services adaptations to existing legislation or drafting of new legislation is necessary. For that purpose the European Commission has enacted several directives over the years. The course gives insight into the main issues on e-commerce such as liability of service providers, electronic contracting, identity theft and online dispute resolution.

### **Toetsvorm**

Paper and assignment

### **Literatuur**

Articles via Blackboard.

### **Doelgroep**

Apart from regular students, the course is also available for:  
 Students from other universities/faculties  
 Exchange students  
 Contractor (students who pay for one course)

### **Overige informatie**

The following course objectives are only available in Dutch:

Eindtermen master Rechtsgeleerdheid

De afgestudeerde master beschikt over een academisch werk- en denkniveau;

heeft diepgaande en specialistische kennis van en inzicht in minimaal één deelgebied van het recht

heeft inzicht in de samenhang tussen verschillende onderdelen van het recht, met inbegrip van het nationale en internationale recht

De afgestudeerde master beschikt over de volgende (juridische) vaardigheden:

Analytische vaardigheden:

de juridische en maatschappelijke aspecten van een vraagstuk in hun onderlinge samenhang beoordelen en daarover kritisch nadenken/oordelen  
 zich inzicht verschaffen in de problemen die zich bij rechtsvorming op

het gekozen deelgebied voordoen en een bijdrage leveren aan oplossing daarvan

een probleem vanuit verschillende deelgebieden op een integratieve manier benaderen

Probleemoplossende vaardigheden:

complexe casus diepgaand analyseren en interpreteren en zelfstandig juridische oplossingen aandragen

complexe juridische problemen onderkennen, analyseren en oplossen

Onderzoeks- en presentatievaardigheden:

individueel een rechtswetenschappelijk onderzoek op academisch niveau voorbereiden en uitvoeren (probleemstelling formuleren en afbakenen,

informatie verzamelen, gegevens interpreteren, conclusies trekken,

evalueren en aanbevelingen en suggesties doen voor verder onderzoek)

schriftelijk presenteren van een wetenschappelijk juridisch betoog

met argumenten onderbouwde mening formuleren over een complex juridisch probleem of een nieuwe ontwikkeling

actief deelnemen aan een wetenschappelijk debat op het deelgebied dat het masterprogramma beslaat

## ICT4D: Information and communication technology for Development

|                      |                                    |
|----------------------|------------------------------------|
| <b>Vakcode</b>       | X_405101 ()                        |
| <b>Periode</b>       | Periode 5                          |
| <b>Credits</b>       | 6.0                                |
| <b>Voertaal</b>      | Engels                             |
| <b>Faculteit</b>     | Faculteit der Exacte Wetenschappen |
| <b>Coördinator</b>   | dr. K.S. Schlobach                 |
| <b>Examinator</b>    | dr. K.S. Schlobach                 |
| <b>Docent(en)</b>    | dr. K.S. Schlobach                 |
| <b>Lesmethode(n)</b> | Hoorcollege, Werkcollege           |
| <b>Niveau</b>        | 400                                |

### Doel vak

In the developed world Computers are ubiquitous, and ICT has rapidly grown into a critical asset for economic, technological, scientific and societal progress. The main objectives of this course are:

1) to make the next generation of Computer Scientists aware of:

a) The importance of ICTs for the developing world and the unexpected way developing countries are leapfrogging into the information age

b) The opportunities and challenges that exist for an information scientist in the area of 'development4development'

c) The influence of context in a typical ICT4D project

d) The complexity of deploying an ICT project within a development context, and how to tackle this.

2) to equip the students with some initial project management, technological and programming skills specific to an ICT deployment in a developing country.

Positioned at the heart of the VU's vision of social relevance as one of the guiding principles, the core aim of the course is to raise the awareness that we as Computer Scientists can make a significant difference by sharing our expertise according to well established principles of international development.

### Inhoud vak

The course will be given jointly by the Department of Computer Science and the Center for International Cooperation, and will consist of 4 modules: two practical ones, and two theoretical ones.

- 1) Analysing a development problem (CIS): this theoretical module will introduce the analytical methods required for an indepth understanding of a potential development support project. A number of invited speakers will introduce general requirements and strategies, as well as more focused on a particular potential project.
- 2) Developing a deployment plan (CIS): in this practical module the students will have to produce a specific deployment plan for an ICT project in a developing country.
- 3) From plan to project (CS): this theoretical module will provide some initial technological knowledge required for running an ICT project in a developing country. It will give an overview over technology already applied, such as specific networks, connection types, hardware as well as specific software environments, but also introduce basic concepts in project management for ICT projects.
- 4) Turn projects into tools (CS): In this practical module the students will actually build a set of deployment tools according to the conditions specified in their deployment plan, including building the required infrastructure, setting up hardware, writing and installing required software, including appropriate documentation and user guidance.

Depending on current actual collaborations of CIS and the CS department a specific type of deployment will be chosen. Examination will be via 2 projects related to those concrete deployment activities of ICT in the development context

### Onderwijsvorm

The course will be a combination of lectures (first 4 weeks) and project work (weeks 5-8).

### Literatuur

Collection of papers.

### Doelgroep

mAI, mCS

## Information Visualization

|                  |                                    |
|------------------|------------------------------------|
| <b>Vakcode</b>   | X_418143 ()                        |
| <b>Periode</b>   | Periode 4                          |
| <b>Credits</b>   | 6.0                                |
| <b>Voertaal</b>  | Engels                             |
| <b>Faculteit</b> | Faculteit der Exacte Wetenschappen |

### Inhoud vak

<http://studiegids.uva.nl/xmlpages/page/2015-2016/zoek-vak/vak/8265>

### Overige informatie

This course is offered at the UvA. For more information contact: FNWI Education Service Centre, Science Park 904, servicedesk-esc-[science@uva.nl](mailto:science@uva.nl), +31 (0)20 525 7100.

Enrolment via <https://m.sis.uva.nl/vakaanmelden> is required.

## Intelligent Interactive Systems

|                    |                                    |
|--------------------|------------------------------------|
| <b>Vakcode</b>     | X_418023 (418023)                  |
| <b>Periode</b>     | Periode 1                          |
| <b>Credits</b>     | 6.0                                |
| <b>Voertaal</b>    | Engels                             |
| <b>Faculteit</b>   | Faculteit der Exacte Wetenschappen |
| <b>Coördinator</b> | dr. F. Nack                        |
| <b>Examinator</b>  | dr. F. Nack                        |
| <b>Niveau</b>      | 400                                |

### Inhoud vak

<http://studiegids.uva.nl/xmlpages/page/2015-2016/zoek-vak/vak/16967>

### Doelgroep

mIS

### Overige informatie

This course is offered at the UvA. For more information contact: FNWI Education Service Centre, Science Park 904, servicedesk-esc-science@uva.nl, +31 (0)20 525 7100.

Enrolment via <https://m.sis.uva.nl/vakaanmelden> is required.

## Interdisciplinary Research Methodology for IS

|                      |   |
|----------------------|---|
| <b>Vakcode</b>       | X_405085 ()                             |
| <b>Periode</b>       | Periode 2                               |
| <b>Credits</b>       | 6.0                                     |
| <b>Voertaal</b>      | Engels                                  |
| <b>Faculteit</b>     | Faculteit der Exacte Wetenschappen      |
| <b>Coördinator</b>   | prof. dr. J.M. Akkermans                |
| <b>Examinator</b>    | prof. dr. J.M. Akkermans                |
| <b>Docent(en)</b>    | prof. dr. J.M. Akkermans, dr. D. Ceolin |
| <b>Lesmethode(n)</b> | Hoorcollege                             |
| <b>Niveau</b>        | 500                                     |

### Doel vak

This course helps prepare students for scientific research and particularly their Master research project and thesis.

After completion of the course the student:

- is able to formulate a research design containing appropriate research questions and how they are answered through applicable research methods, the latter covering qualitative, quantitative and constructive methodologies typical to the IS field
- is able to argue for his/her research design with solid argumentation explaining the underlying assumptions, pros and cons etc. of the chosen methods.
- is able to collect and process the research data according to the different IS research methodologies and to critically judge the obtained results in relation to the research questions



- is able to describe and critically discuss the above activities in a written report, and to present and discuss the results to a scientific audience

### **Inhoud vak**

The course provides an interdisciplinary overview of and hands-on work with different scientific research methods, with an emphasis on ICT/information systems and technologies in interaction with their human, social and organizational contexts.

Topics are:

- scientific research and its goals, the idea of scientific method, in the context of Information Sciences;
- conceptualizing and framing the research questions you want to answer;
- making a research design and planning your research;
- IS conceptualization, theory formation and validation/triangulation;
- research methods and their assumptions, pros and cons (e.g. interview, observation, case study, field and action research, modelling and simulation, experiment, survey, statistical analysis, IS/ICT artefact system design and development);
- how do you (and others) know that your research results are valid?
- scientific argument, communication and research report writing.

### **Onderwijsvorm**

The focus is on students getting hands-on experience with different research methods applied to open-ended research questions.

The setting of the assignment work is that of a continuing research case investigation that emulates different stages of a scientific research project.

The research case question to be investigated differs from year to year.

A representative example is: What is it for systems to be considered "smart" (e.g. smart homes, smart city, smart energy, e-health, etc), and how can we solve problems by making (socio-technical) systems "smarter" with the help of ICT technologies and to the benefit of people?

Students receive weekly feedback on their assignments in discussion sessions with staff supervisors, and are able to improve upon them during the course, until the final portfolio has to be handed in at the end of the course.

### **Toetsvorm**

Portfolio containing a set of group and individual assignments.

Students receive weekly feedback on their assignments, and are able to improve upon them, until the final portfolio has to be handed in at the end of the course.

### **Literatuur**

Textbook: Colin Robson: Real World Research, 3rd Ed., Wiley, 2011 [Note: this book is available in hardcover, paperback and a digital edition].

Other sources are made available via Blackboard.

### **Vereiste voorkennis**

Basic knowledge of qualitative and quantitative research methods.

### **Doelgroep**

mAI, mIS

### **Overige informatie**

This course is taught jointly with UvA under the name Interdisciplinary Research Methodology for IS

For UvA, see

<http://studiegids.uva.nl/xmlpages/page/2014-2015/zoek-vak/vak/742475>

## Knowledge and Media

|                      |   |
|----------------------|---|
| <b>Vakcode</b>       | X_405065 (405065)                         |
| <b>Periode</b>       | Periode 1                                 |
| <b>Credits</b>       | 6.0                                       |
| <b>Voertaal</b>      | Engels                                    |
| <b>Faculteit</b>     | Faculteit der Exacte Wetenschappen        |
| <b>Coördinator</b>   | dr. T. Kuhn MSc                           |
| <b>Examinator</b>    | dr. T. Kuhn MSc                           |
| <b>Docent(en)</b>    | prof. dr. A.T. Schreiber, dr. T. Kuhn MSc |
| <b>Lesmethode(n)</b> | Werkcollege                               |
| <b>Niveau</b>        | 500                                       |

### Doel vak

The goal of the course is to provide insight in the concepts of information organization, knowledge, ontologies and knowledge processes in relation to various ICT-based media.

### Inhoud vak

This course treats the principles and theories that form the foundation of information organization and knowledge-intensive processes in relation to various multi-media applications. Knowledge processes are those processes that use knowledge (reasoning), document knowledge (representation), acquire knowledge or transfer knowledge (teaching). The relation between knowledge processes and (interactive) media will be explored. Various types of applications will be discussed, such as special purpose search engines, educational systems, serious gaming and mind tools.

### Onderwijsvorm

Working lectures

### Toetsvorm

Portfolio

### Literatuur

Articles distributed through Blackboard

We will use The Discipline of Organizing Edited by Robert J. Glushko as a text.

### Doelgroep

UvA students and optional course for mCS, mAI and mIS

## Knowledge Engineering

|                |             |
|----------------|-------------|
| <b>Vakcode</b> | X_405099 () |
| <b>Periode</b> | Periode 2+3 |
| <b>Credits</b> | 6.0         |

|                      |                                    |
|----------------------|------------------------------------|
| <b>Voertaal</b>      | Engels                             |
| <b>Faculteit</b>     | Faculteit der Exacte Wetenschappen |
| <b>Coördinator</b>   | dr. A.C.M. ten Teije               |
| <b>Examinator</b>    | dr. A.C.M. ten Teije               |
| <b>Docent(en)</b>    | dr. A.C.M. ten Teije               |
| <b>Lesmethode(n)</b> | Hoorcollege                        |
| <b>Niveau</b>        | 400                                |

### Doel vak

goals:

- 1) to be able to elicitate knowledge from experts by using several elicitation techniques
- 2) to be able to build all CommonKads models that play a role in the development of a knowledge based system, this includes the context of the KBS and the expertise model based
- 3) to be able to implement the expertise model as a prototype
- 4) to be able to reflect on your own process of modelling and building a knowledge based system, and to reflect on your product (=which are the models and the implementation)

### Inhoud vak

Knowledge Engineering is a discipline that involves integrating knowledge into a program for solving a complex problem, which requires human expertise. Typical tasks are classification, diagnosis, planning etc. In the course we use CommonKADS as the methodology for the process of modeling the organisation, the context and the knowledge intensive tasks.

This methodology give clear guidelines and concrete templates for modeling the organisational aspects and the expertise model, which is the core model of knowledge based system. The notion of pattern-based knowledge modeling is a key issue in the knowledge modelling process. The goal of the final project is to perform the entire knowledge technology process for a knowledge intensive problem of your own choosing, starting with context analysis, up to a (partial) implementation of the knowledge based system.

### Onderwijsvorm

Lectures, assignments, group project

### Toetsvorm

Assignment, project reports.

### Literatuur

Schreiber, Akkermans, Anjewierden, de Hoog, Shadbolt, van de Velde, Wielinga: Knowledge Engineering & Management. The MIT Press, Cambridge MA, 2000, ISBN 0-262-19300-0.

### Doelgroep

mAI, mIS, mCS-TAI

## Master Project Information Sciences

|                |                      |
|----------------|----------------------|
| <b>Vakcode</b> | X_405083 ()          |
| <b>Periode</b> | Ac. Jaar (september) |
| <b>Credits</b> | 18.0                 |

|                    |                                    |
|--------------------|------------------------------------|
| <b>Voertaal</b>    | Engels                             |
| <b>Faculteit</b>   | Faculteit der Exacte Wetenschappen |
| <b>Coördinator</b> | prof. dr. ir. H.A. Reijers         |
| <b>Niveau</b>      | 400                                |

### Doel vak

The Master Project is the culmination of the Information Sciences Master programme. During the project, the scientific and professional skills of the candidate are trained and evaluated. The Master Project will need to incorporate an element of originality or creativity, for example in performing a design task or in contributing to the solution or the analysis of a scientific problem, and needs to be carried out with sufficient academic rigor. Other important elements of the Master Project are the interaction with the business field (and possibly with other students), planning the project, as well as documenting and presenting the final results.

### Inhoud vak

The Master Project concludes the Master programme. The typical form is in essence either an internal graduation project in one of the research groups of the Department of Computer Science or an internship within a professional organization. In most cases it will be performed as an individual project, but it can take on the form of a group project as well - as long as the individual contribution can be clearly distinguished. For additional information and rules we refer to the website of the Faculty of Exact Sciences.

There, you will also be able to find links to the web pages of the research groups of the Department of Computer Science, with options for master projects.

### Onderwijsvorm

The Master Project always needs to be supervised by a staff member. In the case of an internship, the supervision takes place in cooperation with a company supervisor. An internship proposed by a student always needs prior approval from a staff member who will act as supervisor for the project. In this way, the scientific depth of the project can be ensured.

### Toetsvorm

The final grade will be based on the quality of the performed research, the written thesis, and the oral presentation.

### Overige informatie

You will find useful documentation on all aspects of internships and the Master Project at the website of the Internship Office. This office can also give you advise about internships. It also makes sense to check out the web profiles of potential supervisors, e.g. to gather ideas on projects.

## Mobile Systems

|                 |             |
|-----------------|-------------|
| <b>Vakcode</b>  | X_418068 () |
| <b>Periode</b>  | Periode 4   |
| <b>Credits</b>  | 6.0         |
| <b>Voertaal</b> | Engels      |

|                    |                                    |
|--------------------|------------------------------------|
| <b>Faculteit</b>   | Faculteit der Exacte Wetenschappen |
| <b>Coördinator</b> | dr. F. Nack                        |
| <b>Examinator</b>  | dr. F. Nack                        |
| <b>Niveau</b>      | 400                                |

### Inhoud vak

<http://studiegids.uva.nl/xmlpages/page/2015-2016/zoek-vak/vak/8034>

### Doelgroep

mIS

### Overige informatie

This course is offered at the UvA. For more information contact: FNWI

Education Service Centre, Science Park 904, servicedesk-esc-

[science@uva.nl](mailto:science@uva.nl), +31 (0)20 525 7100.

Enrolment via <https://m.sis.uva.nl/vakaanmelden> is required.

## Serious Games

|                      |                                    |
|----------------------|------------------------------------|
| <b>Vakcode</b>       | X_405097 ()                        |
| <b>Periode</b>       | Periode 5                          |
| <b>Credits</b>       | 6.0                                |
| <b>Voertaal</b>      | Engels                             |
| <b>Faculteit</b>     | Faculteit der Exacte Wetenschappen |
| <b>Coördinator</b>   | prof. dr. A.P.W. Eliens            |
| <b>Examinator</b>    | prof. dr. A.P.W. Eliens            |
| <b>Docent(en)</b>    | prof. dr. A.P.W. Eliens            |
| <b>Lesmethode(n)</b> | Hoorcollege                        |
| <b>Niveau</b>        | 400                                |

### Doel vak

Serious games are more and more considered to be an effective means to bring about awareness, acquire skills, change behavior, and influence social patterns. With elementary game development technology, the students will explore the potential of serious games in a social context, using casual game mechanics, and what recently has been identified as the dynamics of gamification.

### Inhoud vak

The course will cover the following topics:

- \* an introduction to game design
- \* practical skills in game development
- \* game mechanics and scoring mechanisms
- \* elementary game and utility theory
- \* media & communication theory
- \* game interaction patterns
- \* practical applications of serious games

Students are required to work in teams of 2-4 people, with as a goal the actual development of a serious game, with social network support.

### Onderwijsvorm

lectures and practicum

**Toetsvorm**

essay and practicum assignment(s)

**Literatuur**

online reference material(s)

**Aanbevolen voorkennis**

preferably, but not obligatory, project interactive multimedia and multimedia authoring

**Doelgroep**

choice for master students CS, IS, and others, with an interest in multimedia and game development

**Overige informatie**

For information and registration, see: [www.cs.vu.nl/~eliens/serious](http://www.cs.vu.nl/~eliens/serious)

## Service Oriented Design

|                      |                                    |
|----------------------|------------------------------------|
| <b>Vakcode</b>       | X_405061 (405061)                  |
| <b>Periode</b>       | Periode 1                          |
| <b>Credits</b>       | 6.0                                |
| <b>Voertaal</b>      | Engels                             |
| <b>Faculteit</b>     | Faculteit der Exacte Wetenschappen |
| <b>Coördinator</b>   | dr. P. Lago                        |
| <b>Examinator</b>    | dr. P. Lago                        |
| <b>Docent(en)</b>    | dr. P. Lago                        |
| <b>Lesmethode(n)</b> | Hoorcollege, Werkcollege           |
| <b>Niveau</b>        | 400                                |

**Doel vak**

Learn advanced design techniques applicable to large service-oriented software systems. Be able to select among them and apply them for a specific system. Be able to reason about and assess the design decisions.

**Inhoud vak**

The lectures explain the concepts related to the Service Orientation software paradigm and Service Oriented Architecture (SOA). The lectures provide the students with knowledge about how to identify the requirements for a service-oriented software system, how to map them on business services and transform them into complex networks of software services. Special emphasis is given to the design reasoning techniques for crucial decision making, service identification, SOA design and migration. Each year experts from academia and industry are invited to give guest lectures.

The students participate in small teams to piecemeal develop understanding of various service-oriented aspects, and work on an assigned SOA design project.

**Onderwijsvorm**

Lectures and group work.

**Toetsvorm**

Written reports of the assignments. Teamwork.

**Literatuur**

Material handed out by the lecturer and on Blackboard.

**Aanbevolen voorkennis**

Software modeling experience (knowledge of UML and SoaML preferred).

Programming.

**Doelgroep**

mAI, mCS, mIS

**Overige informatie**

Registration for this course is compulsory four weeks prior to the start. Further information on this module will be made available on the Blackboard system <http://bb.vu.nl>.

## Software Architecture

|                      |                                    |
|----------------------|------------------------------------|
| <b>Vakcode</b>       | X_400170 (400170)                  |
| <b>Periode</b>       | Periode 2                          |
| <b>Credits</b>       | 6.0                                |
| <b>Voertaal</b>      | Engels                             |
| <b>Faculteit</b>     | Faculteit der Exacte Wetenschappen |
| <b>Coördinator</b>   | dr. P. Lago                        |
| <b>Examinator</b>    | dr. P. Lago                        |
| <b>Lesmethode(n)</b> | Hoorcollege                        |
| <b>Niveau</b>        | 400                                |

**Literatuur**

Len Bass et al, Software Architecture in Practice, 3rd Edition, 2012

**Doelgroep**

mCS, mIS

## The Social Web

|                      |                                    |
|----------------------|------------------------------------|
| <b>Vakcode</b>       | X_405086 ()                        |
| <b>Periode</b>       | Periode 4                          |
| <b>Credits</b>       | 6.0                                |
| <b>Voertaal</b>      | Engels                             |
| <b>Faculteit</b>     | Faculteit der Exacte Wetenschappen |
| <b>Coördinator</b>   | dr. D. Ceolin                      |
| <b>Examinator</b>    | dr. D. Ceolin                      |
| <b>Docent(en)</b>    | dr. L.M. Aroyo, V. Maccatrozzo MSc |
| <b>Lesmethode(n)</b> | Hoorcollege                        |
| <b>Niveau</b>        | 400                                |

**Doel vak**

In this course the students will learn theory and methods concerning communication and interaction in a Web context. The focus is on distributed user data and devices in the context of the Social Web.

**Inhoud vak**

This course will cover theory, methods and techniques for:

- personalization for Web applications
- Web user & context modelling
- user-generated content and metadata
- multi-device interaction
- usage of social-web data

**Onderwijsvorm**

- lectures
- practical sessions
- assignments including final paper

**Toetsvorm**

Weighted average of assignments and final paper

**Literatuur**

- course lecture slides
- selected articles, videos and Web links for each lecture

**Doelgroep**

VU: mIS

UvA: master Information Studies - Human-Centered Multimedia

mCS

mAI

## Thesis Design

|                      |                                    |
|----------------------|------------------------------------|
| <b>Vakcode</b>       | X_405087 ()                        |
| <b>Periode</b>       | Periode 3                          |
| <b>Credits</b>       | 6.0                                |
| <b>Voertaal</b>      | Engels                             |
| <b>Faculteit</b>     | Faculteit der Exacte Wetenschappen |
| <b>Coördinator</b>   | dr. L.M. Aroyo                     |
| <b>Examinator</b>    | dr. L.M. Aroyo                     |
| <b>Lesmethode(n)</b> | Hoorcollege                        |
| <b>Niveau</b>        | 400                                |

**Doel vak**

Students will write a Thesis Design document, in which they will formulate a clear research question in the field of information sciences. To answer this research questions, they will identify a design a methodology and formulate a plan so that the research project can be performed in time.

**Inhoud vak**

The Thesis Design is performed by the student as individual work under regular supervision by a pre- supervisor. Students may propose a supervisor, or ask the master-thesis coordinator for assistance in



finding one.

Students have to write, by the end of period 3, a Thesis Design document (written in English) of max. 6 pages all inclusive, in which he or she has to describe:

- the problem to be addressed in the thesis project,
- the relevance of the problem, based on a literature survey,
- the resulting research question,
- the methodological approach to answer the research question and potential sub questions
- the plan of the thesis work to realize the thesis within the given time frame (end of period 3)

The course will be concluded with a public presentation of the final Thesis Design paper, in a joint presentation session at the end of period 3.

The final electronic version of Thesis Design should be uploaded by the end of the course at <http://wiki.cs.vu.nl/mp>

### Onderwijsvorm

Self study with individual guidance by Thesis Design supervisor.  
Final presentation in a joint presentation session.

### Toetsvorm

The grade is based on the grade for the Thesis Design report and the grade for the final presentation of the report.

### Aanbevolen voorkennis

Prior to the start of the course, students need to register with the Master Coordinator (via Mrs. Ilse Thomson).

To start the course students need to have an approved supervisor for their thesis, latest by December 1, 2013.

### Doelgroep

mIS

## Visual Search Engines

|                  |                                    |
|------------------|------------------------------------|
| <b>Vakcode</b>   | X_417016 ()                        |
| <b>Periode</b>   | Periode 2                          |
| <b>Credits</b>   | 6.0                                |
| <b>Voertaal</b>  | Engels                             |
| <b>Faculteit</b> | Faculteit der Exacte Wetenschappen |
| <b>Niveau</b>    | 400                                |

### Inhoud vak

<http://studiegids.uva.nl/xmlpages/page/2015-2016/zoek-vak/vak/742474>

### Overige informatie

This course is offered at the UvA. For more information contact: FNWI Education Service Centre, Science Park 904, [servicedesk-esc-science@uva.nl](mailto:servicedesk-esc-science@uva.nl), +31 (0)20 525 7100.

Enrolment via <https://m.sis.uva.nl/vakaanmelden> is required.

## Watson Innovation

|                      |  |
|----------------------|--|
| <b>Vakcode</b>       | X_405129 ()  |
| <b>Periode</b>       | Periode 2  |
| <b>Credits</b>       | 6.0  |
| <b>Voertaal</b>      | Engels   |
| <b>Faculteit</b>     | Faculteit der Exacte Wetenschappen                       |
| <b>Coördinator</b>   | dr. L.M. Aroyo   |
| <b>Examinator</b>    | dr. L.M. Aroyo   |
| <b>Docent(en)</b>    | dr. L.M. Aroyo, A. Dumitrache MSc, B.F.L. Timmermans MSc |
| <b>Lesmethode(n)</b> | Hoorcollege  |
| <b>Niveau</b>        | 400  |

### Doel vak

The Watson Innovation course is a collaboration between VU Amsterdam and IBM. In this course you will learn the basics and challenges of Cognitive Computing and how to train Cognitive Computing Systems. You will have the unique opportunity to work with multidisciplinary teams on real prototypes of IBM Watson, and explore its potential for answering questions about the city of Amsterdam. You will also have a chance to showcase developed applications and plans to real clients.

### Inhoud vak

- Basics of Cognitive Computing & IBM Watson
- How to train IBM Watson Instance
- Develop ideas for Cognitive Computing apps
- Build real IBM Watson prototype apps
- Showcase your ideas to real clients

### Onderwijsvorm

Lectures & practical sessions at locations of the VU Amsterdam and IBM Netherlands.

### Toetsvorm

Evaluation of group projects and individual peer-reviews

### Literatuur

Course lecture slides and related articles:

- What is IBM Watson?  
(<http://www.ibm.com/smarterplanet/us/en/ibmwatson/what-is-watson.html>)
- Building Watson: An overview of the DeepQA project  
(<http://www.aaai.org/ojs/index.php/aimagazine/article/download/2303/2165>)
- CrowdTruth papers (<http://crowdtruth.org/papers/>)

### Doelgroep

A balanced mix of Computer Science and Business & Economics students (from VU as well as UvA) in their bachelor or master level.

### Intekenprocedure

Sign up through VUnet and <http://crowdtruth.org/course>.  
For more information contact [b.timmermans@vu.nl](mailto:b.timmermans@vu.nl).

Places are limited, so sign up as soon as possible.

### Overige informatie

There will be no lectures through the Christmas period. The period from 18 December till 10 January is reserved for students individual and group work. Office hours will be provided for additional feedback and questions.

### Web Search

|                  |                                    |
|------------------|------------------------------------|
| <b>Vakcode</b>   | X_418130 ()                        |
| <b>Periode</b>   | Periode 4                          |
| <b>Credits</b>   | 6.0                                |
| <b>Voertaal</b>  | Engels                             |
| <b>Faculteit</b> | Faculteit der Exacte Wetenschappen |
| <b>Niveau</b>    | 400                                |

### Inhoud vak

<http://studiegids.uva.nl/xmlpages/page/2015-2016/zoek-vak/vak/740090>

### Overige informatie

This course is offered at the UvA. For more information contact: FNWI Education Service Centre, Science Park 904, servicedesk-esc-[science@uva.nl](mailto:science@uva.nl), +31 (0)20 525 7100.

Enrolment via <https://m.sis.uva.nl/vakaanmelden> is required.