Computer Science

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This report was finalized on 10 December 2013

Report on the bachelor's programme Computer Science and the master's programmes Computer Science and Parallel and Distributed Computer Systems of VU University Amsterdam

This report takes the NVAO's Assessment framework for limited programme assessments as a starting point.

Administrative data regarding the programmes

Bachelor's programme Computer Science

Name of the programme:	Computer Science
CROHO number:	56978
Level of the programme:	bachelor's
Orientation of the programme:	academic
Number of credits:	180 EC
Specializations or tracks:	none
Location(s):	Amsterdam
Mode(s) of study:	full time
Expiration of accreditation:	31 December 2014

Master's programme Computer Science

Name of the programme:	Computer Science
CROHO number:	60300
Level of the programme:	master's
Orientation of the programme:	academic
Number of credits:	120 EC
Specializations or tracks:	IWT Internet and Web Technology; HPDC High Performance Distributed Computing; SE Software Engineering; MM Multimedia; FMSV Formal Methods and Software Verification; TAI Technical Artificial Intelligence
Location(s):	Amsterdam
Mode(s) of study:	full time
Expiration of accreditation:	31 December 2014

Master's programme Parallel and Distributed Computer Systems

Name of the programme:	Parallel and Distributed Computer Systems
CROHO number:	60802
Level of the programme:	master's
Orientation of the programme:	academic
Number of credits:	120 EC
Specializations or tracks:	None
Location(s):	Amsterdam
Mode(s) of study:	full time
Expiration of accreditation:	31 December 2014

The visit of the assessment committee Computer Science to the Faculty of Sciences of VU University Amsterdam took place on 16-18 October 2013.

Administrative data regarding the institution

Name of the institution:	VU University Amsterdam
Status of the institution:	publicly funded institution
Result institutional quality assurance assessment:	applied (pending)

Quantitative data regarding the programmes

The required quantitative data regarding the programmes are included in Appendix 5.

Composition of the assessment committee

The committee that assessed the bachelor's programme Computer Science and the master's programmes Computer Science and Parallel and Distributed Computer Systems consisted of:

- Prof. dr. J. Paredaens (chairman), retired professor in Database Research, Antwerp University;
- Prof. dr. L. Bijlsma (member), professor in Education and Software Construction and Vice-Dean of the Faculty of Management, Science and Technology, Open Universiteit;
- Prof. dr .ir. B. Preneel (member), professor in Information Security, KU Leuven;
- Prof. dr. S. Mauw (member), professor in Security and Trust of Software Systems, University of Luxembourg;
- R. Verbij Bsc (member), student Computer Science, University of Twente.

The committee was supported by dr. B.M. van Balen, who acted as secretary.

The University of Amsterdam board and the Accreditation Organisation of the Netherlands and Flanders (NVAO) agreed to the composition of the assessment committee. All members of the committee and the secretary signed a declaration of independence as required by the NVAO protocol to ensure that they judge without bias, personal preference or personal interest, and the judgement is made without undue influence from the institute, the programme or other stakeholders.

Appendix 1 contains the curricula vitae of the members of the committee.

Working method of the assessment committee

The assessment of the bachelor's programme Computer Science, the master's programme Computer Science and the master's programme Parallel and Distrbuted Systems was part of an assessment cluster. In total, the committee assessed 26 programmes from ten universities: Open Universiteit, University of Groningen, Eindhoven University of Technology, Utrecht University, University of Amsterdam/VU University Amsterdam, Radboud University Nijmegen, Leiden University and University of Twente.

The assessment committee Computer Science 2013 consisted of 10 members:

- Prof.dr. J. Paredaens (chair), retired professor in Database Research, Antwerp University;
- Prof.dr. L. Bijlsma (member), professor in Education and Software Construction and Vice-Dean of the Faculty of Management, Science and Technology, Open Universiteit;
- Prof.dr.ir. B. Preneel (member), professor in Information Security, KU Leuven;
- Prof.dr. J. van den Herik (member), professor in Computer Science, Tilburg University;
- Prof.dr.ir. K. De Bosschere (member), professor in Computer Science, Ghent University;
- Prof.dr. S. Mauw (member), professor in Security and Trust of Software Systems, University of Luxembourg;
- Prof.dr. S. Mullender (member), Director of the Network Systems Laboratory at Bell Labs, Antwerp and professor Systems Research, University of Twente;
- Prof.dr.ir. W. Van Petegem (member), associate professor and Director Teaching and Learning, KU Leuven;
- P. Boot Bsc (member), student Computer Science, Utrecht University;
- R. Verbij Bsc (member), student Computer Science, University of Twente.

Preparation
The committee held a preliminary meeting on April 26, 2013. During this meeting the committee was instructed about the accreditation framework and the programme of the upcoming assessments. A vice-chair for each visit was appointed and the Domain Specific Framework for Computer Science was set (see Appendix 2).

To prepare the contents of the site visits, the coordinator first checked the quality and completeness of the Critical Reflection Reports prepared by the programmes. After establishing that the Reports met the demands, they were forwarded to the participating committee members. The committee members read the reports and formulated questions on their contents. The coordinator collected the questions and arranged them according to topic.

The committee members read, next to the critical reflections, a selection of fifteen theses for each programme. The theses were randomly chosen from a list of graduates of the last two completed academic years within a range of grades.

Site visit
A preliminary programme of the site visit was made by the project manager and adapted after consultation of the committee chairman and the coordinator of the VU University Amsterdam. The timetable for the visit in Amsterdam is included as Appendix 6.

Prior to the site visit the committee asked the programmes to select representative interview partners. During the site visit meetings were held with panels representing the faculty management, the programme management, alumni, the programme committee and the Board of Examiners. Meetings were also held with representatives of the students and teaching staff. Well in advance of the visit, the committee approved a list of the selected interview partners.

During the site visit the committee examined material it had requested; an overview of this material is given in Appendix 7. The committee gave students and lecturers the opportunity – outside the set interviews – to speak informally to the committee during a consultation hour. No requests were received for this option.

The committee used the final part of the visit for an internal meeting to discuss the findings. The visit was concluded with a public oral presentation of the preliminary impressions and general observations by the chair of the committee.

Report
Based on the committee's findings, the coordinator prepared a draft report. This report was presented to the committee members involved in the site visit. After receiving approval, the draft report was sent to the faculty with the request to check it for factual inaccuracies. The comments received from the programme were discussed with the committee chairman. The final version of the report was sent to the committee members for a final check. Subsequently the definitive report was approved and sent to the VU University, Amsterdam.

Decision rules
In accordance with the NVAO's Assessment framework for limited programme assessments (as of 22 November 2011), the committee used the following definitions for the assessment of both the standards and the programme as a whole.

Generic quality
The quality that can reasonably be expected in an international perspective from a higher education bachelor's or master's programme.

Unsatisfactory
The programme does not meet the current generic quality standards and shows serious shortcomings in several areas.

Satisfactory
The programme meets the current generic quality standards and shows an acceptable level across its entire spectrum.

Good
The programme systematically surpasses the current generic quality standards across its entire spectrum.

Excellent
The programme systematically well surpasses the current generic quality standards across its entire spectrum and is regarded as an (inter)national example.

Summary judgement

The bachelor's programme Computer Science and the master's programme Parallel and Distributed Computer Science are offered by the Department of Computer Science of the Faculty of Sciences of the VU University Amsterdam (VU). The master's programme Computer Science is jointly offered by the University of Amsterdam and VU University Amsterdam and organised by the VU.

The committee assesses the standards from the Assessment framework for limited programme assessments in the following way:

Bachelor's programme Computer Science:

Standard 1
The aim of the bachelor's programme is to provide the student with solid knowledge and skills in the area of computer science. Central in the approach is the concept of a networked world. The combination of on the one hand developing solid knowledge and understanding of general computer science, and on the other hand paying special attention to the phenomena related to the networked world resulted in the definition of the curriculum. The committee concluded that the aims of the bachelor's programme are in line with the Domain Specific Framework of Reference, that was established for the bachelor's programmes Computer Science in the Netherlands. The intended learning outcomes indicate that the students have sufficient knowledge and understanding of the core of computer science to successfully follow a master's programme in Computer Science or a related discipline. The committee has established that the intended learning outcomes are in line with the level according to international requirements for academic bachelor's degree programmes.

Standard 2
Recently it was decided to teach the Computer Science bachelor's programme in English, which resulted in an increased inflow from foreign students. In the curriculum several streams can be distinguished: programming and software engineering, networks and systems, mathematics and theory, intelligent systems and data, human-computer interaction and a set of courses concerned with developing academic skills. A variety of teaching formats is used: lectures, practical work, a mixture of lectures, group work and students presentations, and projects. Every course requires a certain amount of self-study. The committee verified that the students are adequately trained in academic and research skills. The programme is well structured and coherent. The programme enables the students to achieve the intended learning outcomes.

According to the students the study load is feasible. In the first half of the first year students participate in tutor groups and are in addition closely followed by the study advisor.The committee is very positive about this intensive guidance and monitoring by the study advisor.

The students highly appreciate the accessibility of the teachers and are in general positive about the didactic skills of the teachers. The committee is of the opinion that the quality of the teaching staff is good.

The committee established that internationalisation is mainly achieved by the students coming from abroad to the VU, while Dutch bachelor students Computer Science are not inclined to do part of their studies abroad. The committee advises to implement more stimuli for the students to study part of their programme at a university abroad.

The programme-oriented facilities are adequate. The same applies to the programme oriented quality assurance, although the committee recommends the programme committee to act more proactively and focus more on policy level. Furthermore more use could be made of the input of alumni.

Standard 3
The committee concluded that the Department of Computer Science has a valid, reliable and transparent assessment system. The Board of Examiners fulfils its tasks in a responsible and dedicated way. The committee has studied a selection of theses and noticed that most bachelor theses lacked a good introductory part. The quality of one of the bachelor theses is, according to the committee, unsatisfactory. The quality of another bachelor thesis was, according to the committee, dubious, possibly caused by a wrong subject choice. The committee recommends to provide more guidance to the students in the start-up phase of the bachelor thesis. Besides these remarks, the committee concluded that in general the bachelor theses show satisfactorily that the intended learning outcomes are achieved. Furthermore the committee spoke with the alumni and the master students about the quality of the bachelor's programme. Both groups confirmed that they felt sufficiently prepared for a master degree programme in Computer Science and allied disciplines.

Standard 1: Intended learning outcomes	satisfactory
Standard 2: Teaching-learning environment	satisfactory
Standard 3: Assessment and achieved learning outcomes	satisfactory
General conclusion	satisfactory

Master's programme Computer Science:

Standard 1
The master's programme Computer Science refers to the Characteristics of Graduates in the report 'Computer Science Curricula 2013 (Ironman Draft)' to indicate its domain and describes, according to the committee, sufficiently in the critical reflection how the aims and the intended learning outcomes of the programme are derived from this Domainspecific Framework of Reference.

The aim of the programme is to provide students with the knowledge, experience and insights needed to autonomously carry out their professional duties as a computer scientists. The committee noticed that the intended learning outcomes did not contain the ability to independently carry out research. According to the programme's management, this was an omission, which will be as soon as possible repaired, as performing independent research is indeed one of the goals of the programme. Despite this omission the committee is of the opinion that the intended learning outcomes of the programme sufficiently indicate that the programme aims at an academic master's level.

Standard 2
The master's programme offers a number of tracks or specializations: Internet and Web Technology, High-Performance Distributed Computing, Software Engineering, Multimedia, Formal methods and Software Verification and Technical Artificial Intelligence. The number of tracks and names has differed during the assessment period. Each specialisation or track has a core set of compulsory courses. Furthermore, each track requires the students to choose courses from Theoretical Computer Science, Mathematics, Software Engineering, or Programming. All tracks include a master project and literature study. The main didactic

concept in the master's programme is to let the students (independently) deepen their knowledge and participate in the current research. The students are introduced step-by-step in the professional or scientific community, up to the point where they are able to actively participate. The tracks are connected to one of the research groups or sections in Computer Science. The students choose a track and will be part of the research group for the period of their master studies, supervised by a master coordinator.

The students highly appreciate the accessibility of the teachers and are in general positive about the didactic skills of the teachers. The committee is of the opinion that the quality of the teaching staff is good.

The committee established that internationalisation is mainly achieved by the students coming from abroad to the VU, but that Dutch master students Computer Science are not inclined to do part of their studies elsewhere. The committee advises to implement more stimuli for the students to study at a university abroad.

The programme oriented facilities are adequate. The same applies to the programme oriented quality assurance, although the committee recommends the programme committee to act more proactively and focus more on policy level. Furthermore more use could be made of the input of alumni.

Standard 3
The committee concluded that the Department of Computer Science has a valid, reliable and transparent assessment system. The Board of Examiners fulfils its tasks in a responsible and dedicated way. According to the committee the selected master theses in Computer Science show that the students have achieved the intended learning outcomes. All master theses have an adequate academic level. Some of the theses read by the the committee are very good. The committee generally agrees with the grading of the theses although it would have graded some of the theses lower and others higher.

Standard 1: Intended learning outcomes	satisfactory
Standard 2: Teaching-learning environment	satisfactory
Standard 3: Assessment and achieved learning outcomes	satisfactory
General conclusion	satisfactory

Master's programme Parallel and Distributed Computer Systems:

Standard 1
The master's programme Parallel and Distributed Computer Systems (PDCS) refers to the Characteristics of Graduates in the report 'Computer Science Curricula 2013 (Ironman Draft)' to indicate its domain and describes, according to the committee, sufficiently in its critical reflection how the aims and the intended learning outcomes of the programme are derived from this Domainspecific Framework of Reference. The programme has been set up to educate candidates for research-oriented positions. It focuses on scientific excellence and prepares its students for further education at PhD level and for research positions at international institutes. The programme offers fundamental knowledge required to understand complex parallel and distributed systems. The committee concurs with the description in the critical reflection that the profile of the PDCS programme is unique in its focus on research and excellence. The profile is challenging and attractive for ambitious research-oriented students, from the Netherlands as well as from abroad.

Standard 2
The programme consists of four consecutive phases: gaining solid academic knowledge and insights; gaining in-depth understanding via practical skills and the ability to apply skills and knowledge to unknown problems; gaining the skills for scientific work: being able to formulate, analyse and evaluate scientific results; and to propose and perform research tasks and gaining the ability to perform independent research.

The courses are oriented towards the state of the art in Parallel and Distributed Computer Systems. There is a close integration of students and programme with the ongoing research of the Computer Systems section of the VU. The limited number of students enables frequent staff-student interactions. The programme mainly consists of tuition where students are active and interactive with their teachers.

The programme has an admission procedure. Admitted students feel privileged and are very enthusiastic about the content and the level of the programme. Students feel challenged to perform on a high level. The programme attracts students from all over the world. The committee is convinced that the programme is well structured, coherent and aiming at a high level.

The students highly appreciate the accessibility of the teachers and are in general positive about the didactic skills of the teachers. The committee is of the opinion that the quality of the teaching staff is good.

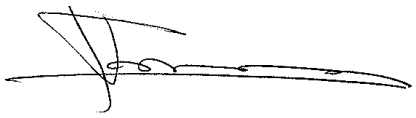
The programme-oriented facilities are adequate. The same applies to the programme-oriented quality assurance, although the committee recommends the programme committee to act more proactively and focus more on policy level. Furthermore more use could be made of the input of alumni.

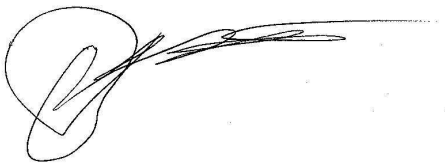
Standard 3
The committee concluded that the Department of Computer Science has a valid, reliable and transparent assessment system. The Board of Examiners fulfils its tasks in a responsible and dedicated way. The committee was impressed by the quality of the master's theses it selected for this programme. The theses show that the graduates have reached the ambitious intended learning outcomes of the programme and have the capabilities to innovatively and autonomously contribute to the development of the research field.

Standard 1: Intended learning outcomes	good
Standard 2: Teaching-learning environment	good
Standard 3: Assessment and achieved learning outcomes	good
General conclusion	good

The chair and the secretary of the committee hereby declare that all members of the committee have studied this report and that they agree with the judgements laid down in the report. They confirm that the assessment has been conducted in accordance with the demands relating to independence.

Date: 10 December 2013





Prof. dr. J. Paredaens

dr. B.M. van Balen

Description of the standards from the Assessment framework for limited programme assessments

The bachelor's and the master's programme Computer Science and the master's programme Parallel and Distributed Computer Science are organised by the Department of Computer Science, one of the four Departments of the Faculty of Sciences of the VU University Amsterdam (VU). In 2013 the Boards of the VU and the University of Amsterdam (UvA) decided to intensify their cooperation. One of the intended decisions is the merger of the Science Faculties of the VU with the Science Faculty of the UvA. Cooperation between these Faculties started already for the master's programmes. In spring 2011 the Deans of the involved Faculties of the UvA and the VU decided to explore the option of two interuniversity master programmes, one in Computer Science, the other in Computational Science. The former would be based on the existing Master Computer Science at the VU University Amsterdam; the latter would be built upon the Master Grid Computing and based at the UvA. The Master Computer Science at VU University Amsterdam, therefore, is jointly offered by both universities.

Standard 1: Intended learning outcomes

The intended learning outcomes of the programme have been concretised with regard to content, level and orientation; they meet international requirements.

Explanation:
As for level and orientation (bachelor's or master's; professional or academic), the intended learning outcomes fit into the Dutch qualifications framework. In addition, they tie in with the international perspective of the requirements currently set by the professional field and the discipline with regard to the contents of the programme.

Findings

This standard deals with the profile and orientation of the programmes and the intended learning outcomes of the Bachelor and Master's programmes.

Profile
The Domain-Specific Frame of Reference (DFR) for the ***bachelor's programme*** **Computer Science** has been chosen in consultation with the other universities in the Netherlands to be the Curricula Computer Science (CS2013) of the 'Joint Task Force on Computing Curricula Association for Computing Machinery IEEE-Computer Society' (see Appendix 2). The aim of the bachelor's programme is to provide the students with solid knowledge and skills in the area of computer science. Central in the approach is the concept of a networked world. The combination of, on the one hand developing solid knowledge and understanding of general computer science, and on the other hand, paying special attention to the phenomena related to the networked world has led to a programme with the following themes: Networked systems, Formal methods, and Software engineering. In addition the programme pays attention to courses related to data processing, and to the development of academic skills. The intended learning outcomes of the bachelor's programme are included in Appendix 3. In the Critical Reflection of the programme it has been indicated how the Knowledge Areas described in the DFR are represented in the courses and the curriculum.

The committee discussed the profile of the programme with teachers and students during the site visit. The teachers mentioned that a deliberate choice was made to integrate mathematics in computer science courses. Consequently, the mathematics in the curriculum is merely applied. The students recognised this choice in the profile of the VU bachelor's programme, which they described as being more applied than e.g. the bachelor's programme of the UvA. For some of the students this was a reason to choose the VU programme. The committee respects this choice and established that the profile and orientation of the programme are in line with the DFR and what can be expected of an academic bachelor's programme.

Both master's programmes refer to the Characteristics of Graduates in the report 'Computer Science Curricula 2013 (Ironman Draft)' (Appendix 2) to indicate their domain and describe, according to the committee, sufficiently in their critical reflections how the aims and the intended learning outcomes of the programmes are derived from this DFR.

The aim of the ***master's programme in Computer Science*** is to provide the student with the knowledge, experience and insights needed to autonomously carry out his/her professional duties as a computer scientist. The programme is designed to prepare students for further education as scientific researchers as well as to offer a solid basis for a career in business at an academic level. The programme aims at educating students as to acquire a practical understanding of the position of the field of Computer Science with a broad scientific and social context. The intended learning outcomes of the programme are included

in Appendix 3. The committee has noticed that the programme offers several tracks. In the Critical Reflection the following tracks were mentioned: Internet and Web Technology, High-Performance Distributed Computing, Software Engineering, Multimedia, Formal methods and Software Verification and Technical Artificial Intelligence. However, other documents as well as the students named other tracks. It was not clear from the documentation how many tracks currently exist and what their titles are. The frequent changes of the names and the number of tracks, although based on good reasons, are not adding to the transparency of the profile.

The intended learning outcomes of the ***Parallel and Distributed Computer Systems master's programme*** (PDCS) are included in Appendix 3. The programme has been set up to educate candidates for research-oriented positions. It focuses on scientific excellence and prepares students for further education at PhD level and for research positions at international institutes. The programme offers fundamental knowledge required to understand complex parallel and distributed systems. In addition, students get much practical 'hands on' experience, and learn how to approach problems individually and how to reason logically and analytically. Students learn to critically analyse given scientific results and they learn the academic standards and procedures for scientific reviewing. Also, students train their communication skills, both oral and written, and they learn how to collaborate with staff members on specific projects. With the final Master project, students independently perform a larger piece of research-oriented work, after the conclusion of which they possess the scientific skills for becoming either a PhD student or a highly-skilled computer professional. The committee concurs with the description in the critical reflection that the profile of the PDCS programme is unique in its focus on research and excellence. The profile is challenging and attractive for ambitious research-oriented students, from the Netherlands as well as abroad.

Level and orientation
After having studied the curriculum and the Critical Reflection the committee established that the aims of the ***bachelor's programme*** are in line with the DFR. The intended learning outcomes indicate that the students have sufficient knowledge and understanding of the core of computer science to successfully follow a master's programme in Computer Science or a related discipline. The intended learning outcomes show that the students are educated at an academic level; they acquire for instance thorough theoretical and practical knowledge in computer science (Appendix 3, 1) and are introduced in research and development in computer science and trained in the academic skills necessary to conduct research (Appendix 3, 2).

The intended learning outcomes of the ***master's programme Computer Science*** have been discussed with the management and the teachers during the site visit. The committee noticed that they did not contain the ability to independently carry out research. According to the programme's management, this was an unintended omission, as performing independent research is indeed one of the goals of the programme. Despite this omission the committee is of the opinion that the intended learning outcomes of the programme sufficiently indicate the programme aims at an academic master's level as can be read in the learning outcomes: 'Be able to consult and use the (international) professional literature in the relevant sub areas of the field of computer science.' (7) and 'Be able to formulate, analyse and evaluate scientific results, and to use them to draw conclusions.' (8).

The intended learning outcomes of the ***PDCS programme*** adequately describe the level and orientation that can be expected from a research-oriented master's programme as e.g.

indicated in 'be aware of the applications of computer science in general and of Parallel and Distributed Computer Systems in particular and be able to apply his/ her knowledge and skills to new or otherwise unknown problems;' (4); 'be capable of designing a research or project plan on the basis of a realistic problem description in the field of computer science' (5); 'be able to perform research work independently, both individually and in small teams' (6).

Considerations

The committee has established that the learning outcomes defined for the bachelor's programme Computer Science and the master's programmes Computer Science and Parallel and Distributed Computer Systems are in line with the Domain specific Framework of Reference and with the level according to international requirements for academic bachelor's and master's degree programmes.

The committee appreciates the profile of the bachelor's and master's programme Computer Science. This profile is clear and recognizable for the students. The committee recommends however to provide clear information about the number and the titles of the tracks offered in the master's programme Computer Science.

The profile of the PDCS programme is in the opinion of the committee challenging, attractive and unique.

Conclusion

Bachelor's programme Computer Science: the committee assesses Standard 1 as **satisfactory**.
Master's programme Computer Science: the committee assesses Standard 1 as **satisfactory**.
Master's programme Parallel and Distributed Computer Systems: the committee assesses Standard 1 as **good**.

Standard 2: Teaching-learning environment

The curriculum, staff and programme-specific services and facilities enable the incoming students to achieve the intended learning outcomes.

Explanation:
The contents and structure of the curriculum enable the students admitted to achieve the intended learning outcomes. The quality of the staff and of the programme-specific services and facilities is essential to that end. Curriculum, staff, services and facilities constitute a coherent teaching-learning environment for the students.

Findings

The committee has studied the curricula of the programmes, has seen the course material, the digital learning environment and results of course evaluations. In this standard the findings of the committee concerning the content and structure of the programme, the intake and the study load, the teaching staff and the facilities are discussed.

Programme The curriculum of the first two years of the ***bachelor's programme*** consists of obligatory courses. The third year contains two obligatory courses of 6 EC each, the minor for 30 EC and the bachelor project and Seminar Critical Thinking (18 EC in total). In the programme several streams can be distinguished:

- A stream related to programming and software engineering.
- A stream related to networks and systems.
- A stream related to mathematics and theory, mainly concerning logic, algorithms, and discrete mathematics.
- A stream concerned with intelligent systems and data.
- A stream concerned with human-computer interaction.
- A set of courses concerned with developing academic skills.

The committee appreciates the way the curriculum is structured along streams. This structure ensures that all basis subjects are covered in the courses and it also explains the coherence in the curriculum.
An overview of the courses is presented in Appendix 4.

The free choice takes up two parts of the third-year curriculum: the minor, which consists of 30 EC and the combination of the bachelor project and the Seminar Critical Thinking of in total 18 EC. The choice of contents of the bachelor project and the Seminar Critical Thinking are free, provided a staff member is willing and able to supervise the project. A student can start a bachelor project if he/she has completed almost all courses of the bachelor's programme.

The Critical Reflection describes the teaching concept in line with the VU slogan to have a 'community of learners'. One of the five characteristics of this community of learners is that 'students will get familiar with the culture of research and the practice as academic professional'. This is a central goal in the vision on education of the Department of Computer Science. It is reflected in the way courses are taught and students are approached. A variety of teaching formats is used: lectures, practical work, a mixture of lectures, group work and students' presentations, and projects. Every course requires a certain amount of self-study.

As discussed in standard 1 mathematics is integrated in the computer science courses. The committee understands the reasons of the programme management for this decision. Some students, however, mentioned that they would have liked the opportunity to study more in-depth mathematics. They were searching for solutions by following mathematics courses elsewhere which is not optimal in regard to time scheduling and focus. The students also mentioned that due to this integration the same mathematical issues are taught in several courses. This repetition is not appreciated by all students, although some also benefit by it. The committee would recommend reconsidering the overlap between courses in this respect. Some repetition can be effective, but too much can be de-motivating for the better students.

The committee verified that the development of academic research and writing skills is addressed within the programme. The students are adequately trained in academic and research skills. The committee discussed the programme with the students and teachers and is convinced that the bachelor's programme Computer Science is well structured and coherent. The programme enables the students to achieve the intended learning outcomes.

Each specialisation or track in the ***master's programme Computer Science*** has a core set of compulsory courses. Furthermore each track requires the students to choose courses from Theoretical Computer Science, Mathematics, Software Engineering, or Programming (compulsory optional courses 6 EC per area). All tracks include a master project and literature study. An overview of the programme is presented in Appendix 4.

The main didactic concept in the master's programme is to let the student (independently) deepen his/her knowledge and participate in the current research. The student is introduced step-by-step in the professional or scientific community, up to the point where he is able to actively participate. The tracks are connected to one of the research groups or sections in Computer Science. The student chooses a track and will be part of the research group for the period of his master study, supervised by a master coordinator.

The committee discussed the programme with the master students and teachers during the site visit. There are big differences in students' interests for tracks. Some tracks are chosen by only one or two students and other by fifteen to twenty. This has an impact on the students'experiences and their appreciation for the programme. Most students, however, are positive about the programme, in particular the fact that they become part of a research group and participate in the seminars of this group.

The ***PDCS programme*** consists of four consecutive phases:

- Gaining solid academic knowledge and insights. This phase is mostly comprised of lecture courses
- Gaining in-depth understanding via practical skills and the ability to apply skills and knowledge to unknown problems. This phase is mostly comprised of practical (programme-oriented) lab courses.
- Gaining the skills for scientific work: being able to formulate, analyse and evaluate scientific results, and to propose and perform research tasks. This phase is mostly comprised of seminars.
- Gaining the ability to perform independent research. This phase consists of the master project.

The courses in this programme are oriented towards the state of the art in Parallel and Distributed Computer Systems. There is a close integration of students and programme with

the ongoing research of the Computer Systems section of the VU. The limited number of students enables frequent staff-student interactions. The programme mainly consists of tuition where students are active and interactive with their teachers. Students are expected to participate actively, to take part in seminars and discussions, and frequently have to give presentations or hand in papers and assignments. The teachers in this programme form a coherent team. They meet frequently and have a clear and common vision on the programme and the relation with the research of the Department. An overview of the programme is included in Appendix 4. The students who are admitted to this programme feel privileged and are very enthusiastic about the content and the level of the programme. Students feel challenged to perform at a high level. The programme attracts students from all over the world. The committee is convinced that the programme is well structured, coherent and aiming at a high level.

The committee established that internationalisation is mainly achieved for the students coming from abroad to the VU, but that Dutch bachelor and master students Computer Science are not inclined to do part of their studies elsewhere. The committee advises to implement more stimuli for the students to study at a university abroad.

Intake, study load and study progress
Recently it was decided to teach the whole ***bachelor's programme*** in English, this has resulted in an inflow of foreign students. The teachers are positive about the differentiation resulting from this inflow. The foreign students are very motivated and stimulate the other students. The next development will be the merger with the UvA bachelor's programme, discussions are still in the orientation phase. Recently there has been a growth in intake of students. This growth can be caused by the general trend that more young people choose for a science-oriented university education. The programme introduced a Binding Study Advice in 2011-2012. An effect can be seen in the growth of the dropout rate after one year (see Appendix 5 for the quantitative data). The committee appreciates the decision to teach the whole programme in English and the orientation on the international 'market'. The study progress of the students according to the data presented in Appendix 5 improved in the last years. However, the committee is of the opinion that an average study duration of 54 months for a 36 months programme still is too long. The programme didn't set any targets in that respect.

According to the students the study load is feasible, even with a part-time job. However, the committee talked to a selection of motivated and better students, who didn't seem to have difficulties with the level and pace during their studies. As mentioned the Binding Study Advice (BSA) is recently introduced. The main goal of the BSA is to 'filter out' students that perform poorly. A student needs to pass at least 36 of 60 EC of the first-year courses. The programme management introduced tutoring in the bachelor's programme. This tutoring is part of the Introduction to Computer Science course in the first period of the first year. Groups of roughly 12 students are tutored by a staff member of the Computer Science Department. During the site visit it was explained that recently the tutoring meetings have been more focused on Computer Science content in reaction to student comments. This is much appreciated by the committee. Next to the tutoring, study-advisors are available for all students. The study-advisor actively invites all students for an individual meeting in the first year. Not all students accept the invitation. Students who risk failing are closely monitored and frequently contacted. Moreover all students who are still registered are again invited for interviews in the second and third year. The efforts and accessibility of the study advisors are highly appreciated by the students. The committee is very positive about this guidance.

The ***Computer Science master's programme*** attracts a fairly high number of students from abroad (see Appendix 5). It is remarkable that the students mentioned that one of the reasons to come to the VU is the responsiveness of the university during the period of orienttion and registration, the website is easily accessible, emails are swiftly answered and telephone calls are taken. The committee compliments the VU on this policy. Data about study duration as presented in Appendix 5 are not easy to interpret. It seems that the study duration is increasing but this can almost certainly be explained by the relatively recent introduction of the 'harde knip', which means that students are required to finish their bachelor before being admitted to a master programme. An average study duration of 30 months for a 24 months programme (graduates in 2011-2012) can in the opinion of the committee still be improved. Students mention that they have to work harder than in the bachelor's programme, but they do not feel that as a burden. In the view of the students the programme is feasible.

For admission to the ***PDCS*** programme, students have to apply, demonstrating that they fulfil the following requirements:

- a BSc degree in Computer Science or Computer Engineering for a university of a European Union member state or equivalent;
- proficiency in English, proven by an internationally accepted test such as TOEFL or IELTS;
- demonstrated ability and motivation for studying in a research-oriented context, individually assessed during the admission procedure.

All applications are individually evaluated by a selection committee. The formal decision to admit students is taken by the Board of Examiners. Approximately 2/3 of the applicants are rejected. The cohort size is strongly varying (see Appendix 5), but the programme does not adjust its admission requirements. This is appreciated by the committee. The dropout rate is relatively low and the study duration is in line with the scheduled duration. Students admitted to this programme feel privileged and are motivated to work hard. The study load is in their view not too high and they did not mention any obstacles in the programme.

Teaching staff

The courses in the programmes are staffed by scientists from the Computer Science Department. A Staff List was provided as an Appendix to the Critical Reflection. Almost all teachers are actively involved in current research of the department. It is the policy of the department that every staff member who holds a tenured position uses 40% of his time for teaching, 40% for research and 20% on managerial and commission tasks. The staff members also teach in the other bachelor's and master's programmes of the Department (for example Lifestyle Informatics or Information, Multimedia and Management). The department has an explicit policy to appoint the best tutors to teach in the early phases of the bachelor's programme. The teaching staff meets monthly to discuss day-to-day running of courses, the relationship between courses, and short-term developments in the programmes. The course evaluations are discussed in these meetings.

New tenured staff members are expected to get the VU teaching qualification (BKO). For existing staff the Faculty offers two tailor-made programmes to ensure that from 2014 onwards all staff members have their BKO. All staff members who are involved in courses taught in English must have proven English language skills. The committee appreciates these targets and efforts.

The students highly appreciate the accessibility of the teachers and are in general positive about the didactic skills of the teachers. The committee is of the opinion that the quality of the teaching staff is good. As mentioned, the work of the study-advisors is highly appreciated.

Programme related facilities
The committee discussed the facilities with the students during the site visit. Students indicated that the infrastructure, i.e. computer facilities, software, possibilities for programming and for doing research is sufficient. The committee did not observe any problems concerning the facilities and got an impression of the building during the visit. It concludes that the programme-related facilities are adequate.

Programme related quality assurance
The committee had meetings with the Board of Examiners and with the Programme Committee. Both have a crucial position in quality assurance. Every year, each course is evaluated by students using the standard questionnaires from the VU. These questionnaires are handed out either during the written exam or after the final class of the course. The results of the course evaluations are sent to the teacher and the Director of Education of the Computer Science Department. The course evaluations form also input for the yearly evaluation that every staff member has with his or her superior. The results are discussed in the Programme Committee meetings and the monthly teacher meetings (Doc-teams).

Every year the VU University participates in the Nationale Studenten Enquête (NSE), which is a Key Performance Indicator used by the University Board. Also, when students apply for graduation, they receive a questionnaire querying their opinion about the programme as a whole. The results of both evaluations are also discussed in the teacher meetings and the Programme Committee. All these evaluations are used to spot weaknesses in the programme and possible solutions are proposed and discussed.

The committee noticed that the Programme Committee meets only four times per year and merely discusses evaluation results. In the view of the committee the Programme Committee could act more proactively and aim more at the policy level. Furthermore the results of the evaluations are not publicly available to the students. Students mentioned that they did not get any feedback on the evaluations and do not know what kind of actions are taken as a result from these evaluations. The committee advises to publish the evaluation results and inform the students about the actions taken.

The contacts with alumni can be strengthened. The committee is of the opinion that better use could be made of the input of alumni. The committee recommends to facilitate an alumni association and to establish an Advisory Board for contacts with the Working Field.

Considerations

The committee is of the opinion that the bachelor's programme Computer Science is well structured and coherent. The students are adequately trained in academic and research skills. The programme enables the students to achieve the intended learning outcomes. The programme is feasible and the students are well guided. The committee is very positive about the study advisors and their role in the guidance of the students.

The master's programme Computer Sciences prepares the students for obtaining their final qualifications. The programme enables the students to develop academic and research skills and prepares them sufficiently for the master's thesis.

The master's programme Parallel and Distributed Computer Systems attracts students from all over the world. The programme is intensive and challenging and stimulates the students to perform on a high level. There is a strong relation between research and teaching in this programme. The committee is convinced that the programme is well structured, coherent and aiming at a high level. The students who are admitted to this programme feel privileged and are very enthusiastic about the content and the level of the programme. The committee concurs with the students. The concept of PDCS to include students from the start of the master programme in the research groups is recommended for the tracks in the Computer Science programme.

The committee established that internationalisation is mainly achieved for the students coming from abroad to the VU, while Dutch bachelor and master students Computer Science are not inclined to do part of their studies elsewhere. The committee advises to implement more stimuli for the students to follow courses or carry out projects at a university abroad.

The accessibility of the teachers is appreciated and the quality of the teaching staff is good.

The programme-oriented facilities are adequate. The same applies to the programme-oriented quality assurance, although the committee recommends the programme committee to act more proactively and focus more on policy level. Furthermore more use could be made of the input of alumni.

Conclusion

Bachelor's programme Computer Science: the committee assesses Standard 2 as **satisfactory**.
Master's programme Computer Science: the committee assesses Standard 2 as **satisfactory**.
Master's programme Parallel and Distributed Computer Systems: the committee assesses Standard 2 as **good**.

Standard 3: Assessment and achieved learning outcomes

The programme has an adequate assessment system in place and demonstrates that the intended learning outcomes are achieved.

Explanation:
The level achieved is demonstrated by interim and final tests, final projects and the performance of graduates in actual practice or in post-graduate programmes. The tests and assessments are valid, reliable and transparent to the students.

Findings

This section deals with the assessment system and the level achieved by the graduates of the programmes. These subjects will be described in sub sections. In order to establish an opinion about these subjects the committee studied the assessment system and policy of the programme, the test procedures, test regulations, the used test forms and several tests made by students. The committee also had a meeting and discussion with the Board of Examinators (BoE).

The committee studied a selection of theses for each of the programmes to assess the achieved level of the graduates and had discussions with the students, teachers and alumni about the qualifications of the graduates and the relation to the requirements of the labour market.

Assessment system
VU University Amsterdam has assembled a handbook on the quality of education which gives guidelines for testing and testing policy. These guidelines are the basis for the Faculty of Sciences guidelines. Most courses use multiple assessment forms in order to stimulate the student to be actively involved in the learning process. The following assessment methods are used:

- Written Exams test the student's insight and knowledge of the contents of the course. Mostly, this form of assessment is used in combination with other forms. A written exam usually takes 2 hours and 45 minutes, is done individually, and is usually closed-book but sporadically open-book.
- Practical work usually consists of programming assignments which can be done in a group or individually. A programming assignment tests the problem solving and modelling abilities of a student, and sometimes also his or her skill to work together with other students.
- Written assignments usually consist of a set of exercises, the solutions of which have to be handed in individually, and contribute to the final degree.
- Reports and Presentations not only test knowledge and insight but also the student's ability and skill to communicate and to present the acquired knowledge and insight in a clear and scientific manner.

Students have the right to appeal against the way the examination of a course has been carried out, this can be done directly to the centrally organised Appeals Commission. If less than 50% of the students pass the exam, the Curriculum Director and the sub-committee of the BoE will be informed before the grades are published. The assessment as a whole is then discussed and the BoE will take appropriate actions.

The Faculty of Science has one central Board of Examinators, which is subdivided into domain-related committees. The members are appointed by the Faculty Board. There is one sub-committee for all bachelor's and master's programmes of the Computer Science Department, which handles all matters related to these programmes. The recently changed role of the Board of Examinators is implemented in several ways. The BoE e.g. has created an Assessment Sub-Committee that is mandated to formulate an assessment policy.

The BoE appoints the examiners for each course. Next to the teacher, every course has a second examiner whom the first teacher consults for validation of the assessments of the course (four-eyes principle). The BoE randomly samples the quality of the assessments and their results. The BoE writes a yearly report providing detailed information on its functioning and the work performed during the academic year. The BoE monitors whether the assessments, the theses and the awarded diplomas are of the required quality and level.

The committee concluded on basis of the information provided and the interviews during the site visit that the Department of Computer Science has a valid, reliable and transparent assessment system. The BoE fulfils its tasks in a responsible and dedicated way. The committee has studied a selection of theses and has spoken with several panels about the assessment of the theses. The committee is positive about the fact that assessment forms are used for the assessment of the theses, but not all forms were adequately filled out. Many assessment forms lacked argumentation for the scores, which made the assessment not very transparent. The committee discussed this issue with the teachers and the BoE, who recognized this and explained that they will be restructuring the form to stimulate the examiners to add argumentation.

Achieved learning outcomes
The committee selected 15 bachelor theses, 10 master theses Computer Science and 10 master theses PDCS to assess whether these theses show that the intended learning outcomes are achieved by the graduates.

The committee noticed that most ***bachelor*** theses lacked a clear introduction. The problem description was sometimes weak and the students did not sufficiently explain why they chose this subject and what the academic and societal context is of their subject. Furthermore, several bachelor theses had only a limited number of references included. The committee recommends improving the thesis instructions in that respect. The quality of one of the bachelor theses is, according to the committee, unsatisfactory. Three committee members read this thesis and all came to the same conclusion. The quality of another bachelor thesis was, according to the committee, dubious, caused by a wrong subject choice. The committee recommends providing more guidance to the students during the selection of a thesis subject. Besides these remarks, the committee concluded that in general the bachelor theses show satisfactorily that the intended learning outcomes are achieved. Furthermore the committee discussed with the alumni and the master students the quality of the bachelor's programme. Both groups confirmed that they felt sufficiently prepared for a master degree programme in Computer Science and related disciplines.

According to the committee the ***master theses Computer Science*** show that the students have achieved the intended learning outcomes. All master theses have an adequate academic level. Some of the theses the committee has seen were very good. The committee generally agrees with the grading of the theses although it would have graded some of the theses lower and others somewhat higher.

The level of the ***PDCS*** theses is according to the committee in line with the ambitions of the programme. The theses show that the graduates have reached the ambitious intended learning outcomes of the programme and have the capabilities to innovatively and autonomously contribute the development of the research field. All theses of this programme received high grades by the examiners and the committee agrees with this grading. The theses show that the students achieve a high level and that the graduates are very well prepared to continue their career in research. Many of the theses lead to scienctific publications.

Considerations

The committee has established that the Department of Computer Science has a transparent, reliable and valid assessment system. The Board of Examiners fulfils its legal tasks and is proactively engaged with improving the quality of the assessment.

The committee has established the students achieve the intended learning outcomes of the bachelor's and the master's programme Computer Science. The committee was impressed by the level achieved by the students PDCS and concludes that this programme achieves its high ambitions.

Conclusion

Bachelor's programme Computer Science: the committee assesses Standard 3 as **satisfactory**.
Master's programme Computer Science: the committee assesses Standard 3 as **satisfactory**.
Master's programme Parallel and Distributed Computer Systems: the committee assesses Standard 3 as **good**.

General conclusion

The committee concluded that the bachelor's and the master's programme Computer Science of the VU University Amsterdam have the quality that can be expected in an international perspective from a higher education bachelor's, respectively master's programme. The programmes meet the standards required for accreditation.

The committee concluded that the master's programme Parallel and Distributed Computer Systems is a unique, attractive and ambitious programme, which enables the students to reach a high level. This programme is assessed as good.

Conclusion
The committee assesses the *bachelor's programme Computer Science* as **satisfactory**.
The committee assesses the *master's programme Computer Science* as **satisfactory**.
The committee assesses the *master's programme Parallel and Distributed Computer Systems* as **good**.

Appendices

Appendix 1: Curricula vitae of the members of the assessment committee

Prof. em. J. (Jan) Paredaens was a professor at the University of Antwerp and is now dean of the Faculty of Design Sciences at the same university. He graduated as a mathematician from the Free University of Brussels and was awarded his doctorate in 1974 from the Free University of Brussels. He worked until 1979 in the research centre of the company MBLE in Brussels. In 1979 he was appointed lecturer in Informatics at the University of Antwerp. He filled various positions, including Dean of the Sciences Faculty. He has already been a member of the Informatics review committee in the Netherlands. His scientific specialisation is 'Databases and Data mining', on which he has published over 100 international scientific articles. He has also organised a number of international conferences in his subject and is a member of the 'Executive Committee of PODS' in the USA. He was member/chair of numerous Belgian and international committees and panels.

Prof. dr. Lex Bijlsma (1949) is professor Education and Softwareconstruction and dean of the Faculty Computer Science Open University. He graduated in mathematics in 1973 at the University of Amsterdam and did a PhD on theory of numbers at the same university in 1978. Thanks to a ZW grant he could do research at the *Institut des Hautes Etudes Scientifiques in Bures-sur-Yvette* in 1978-79. In 1979 he became assistant professor at the Eindhoven University of Technology and specialised in computer science. In 1999 Bijlsma was appointed associate professor at Utrecht University, in 2000 director of education computer science and in 2011 also director of education in informatics. In 2007 he was appointed full professor at the Open University. His interest concerns programming methodology, mathematical methods in computer science and software-architecture.

Prof.dr. ir. Bart Preneel is professor at the Department Electrical Engineering-ESAT of the KU Leuven. He received his PhD in 1993 at the KU Leuven in the area of cryptology. He is head of the research group COSIC that foscuses on cryptology, information security and privacy. He was research fellow at UC Berkeley, guest lecturer at 5 universities and academic advisor of Philips. He is president of the IACR (International Association for Cryptologic Research) and member of the Permanent Stakeholders group of ENISA (European Network and Information Security Agency). He participated in several scientific committees, among which: ERC, EPSRC, FNRS, NSF, NWO and STWW**.**

Prof. dr. Sjouke Mauw is professor in computer security at the University of Luxemburg since 2007. After studying Mathematics at the University of Amsterdan, he obtained his PhD in computer science at the same university. After his position as an assistant professor at the University of Amsterdam, he was appointed assistant (1992) and later associate (1999) professor at the Eindhoven University of Technology. He has been a research fellow at the CWI in Amsterdam. At the University of Luxembourg, Mauw leads a research group focusing on the application of formal methods in the areas of security and trust. In addition, he has published in a variety of research areas, such as process algebra, domain-specific languages, testing, distributed algorithms and bio-informatics.

R. (Ruud) Verbij, Bsc, is a student of the master in Computer Science, security specialisation track, of the University of Twente, Radboud University of Nijmegen and the Technical University of Eindhoven. As a student Ruud has committed himself to education, for example by being on the education evaluation committee for 3 years, the programme committee for 2 years and a full-time year on the board of his student association. Since September 2010 Ruud has been a student panel member for the accreditation of initial

programmes for the NVAO and since September 2012 also for institutional reviews. In January 2013 Ruud set up his own consultancy firm in the field of programme accreditation.

Appendix 2: Domain-specific framework of reference

Domain-specific frame of reference for Bachelor-level courses in Computer Science

Characteristics of Graduates
At a broad level, the expected characteristics of computer science graduates include the following:

1. **Technical understanding of Computer Science.** Graduates should have a mastery of computer science as described by the core of the Body of Knowledge.
2. **Familiarity with common themes and principles.** Graduates need understanding of a number of recurring themes, such as abstraction, complexity, and evolutionary change, and a set of general principles, such as sharing a common resource, security, and concurrency. Graduates should recognize that these themes and principles have broad application to the field of computer science and should not consider them as relevant only to the domains in which they were introduced.
3. **Appreciation of the interplay between theory and practice.** A fundamental aspect of computer science is understanding the interplay between theory and practice and the essential links between them. Graduates of a computer science program need to understand how theory and practice influence each other.
4. **System-level perspective.** Graduates of a computer science program need to think at multiple levels of detail and abstraction. This understanding should transcend the implementation details of the various components to encompass an appreciation for the structure of computer systems and the processes involved in their construction and analysis. They need to recognize the context in which a computer system may function, including its interactions with people and the physical world.
5. **Problem solving skills.** Graduates need to understand how to apply the knowledge they have gained to solve real problems, not just write code and move bits. They should also realize that there are multiple solutions to a given problem and that selecting among them is not a purely technical activity, as these solutions will have a real impact on peoples lives. Graduates also should be able to communicate their solution to others, including why and how a solution solves the problem and what assumptions were made.
6. **Project experience.** To ensure that graduates can successfully apply the knowledge they have gained, all graduates of computer science programs should have been involved in at least one substantial project. In most cases, this experience will be a software development project, but other experiences are also appropriate in particular circumstances. Such projects should challenge students by being integrative, requiring evaluation of potential solutions, and requiring work on a larger scale than typical course projects. Students should have opportunities to develop their interpersonal communication skills as part of their project experience.
7. **Commitment to life-long learning.** Graduates of a computer science program should realize that the computing field advances at a rapid pace. Specific languages and technology platforms change over time. Therefore, graduates need to realize that they must continue to learn and adapt their skills throughout their careers. To develop this ability, students should be exposed to multiple programming languages, tools, and technologies as well as the fundamental underlying principles throughout their education
8. **Commitment to professional responsibility.** Graduates should recognize the social, legal, ethical and cultural issues involved in the deployment and use of computer technology. They should respond to these issues from an informed perspective, guided by personal and professional principles. They must further recognize that social, legal, and ethical standards vary internationally.

9. **Communication and organizational skills.** Graduates should have the ability to make succinct presentations to a range of audiences about technical problems and their solutions. This may involve face-to-face, written, or electronic communication. They should be prepared to work effectively as members of teams. Graduates should be able to manage their own learning and development, including managing time, priorities, and progress.
10. **Awareness of the broad applicability of computing.** Platforms range from embedded micro-sensors to high-performance clusters and distributed clouds. Computer applications impact nearly every aspect of modern life. Graduates should understand the full range of opportunities available in computing.
11. **Appreciation of domain-specific knowledge.** Graduates should understand that computing interacts with many different domains. Solutions to many problems require both computing skills and domain knowledge. Therefore, graduates need to be able to communicate with, and learn from, experts from different domains throughout their careers.

Knowledge Areas

knowledge area	core	
AL Algorithms and Complexity	28	9%
AR Architecture and Organization	16	5%
CN Computational Science	1	0%
DS Discrete Structures	41	13%
GV Graphics and Visual Computing	3	1%
HC Human-Computer Interaction	8	3%
IAS Security and Information Assurance	8	3%
IM Information Management	10	3%
IS Intelligent Systems	10	3%
NC Networking and Communication	10	3%
OS Operating Systems	15	5%
PBD Platform-based Development	0	0%
PD Parallel and Distributed Computing	15	5%
PL Programming Languages	28	9%
SDF Software Development Fundamentals	42	14%
SE Software Engineering	27	9%
SF System Fundamentals	27	9%
SP Social and Professional Issues	16	5%
Total	305	100%

Domain-specific frame of reference for Master's courses in Computer Science

Learning outcomes in general

The Dublin descriptors indicate in general terms what levels a student should reach in knowledge and understanding, the application of knowledge and understanding, forming judgments, communication and learning skills to award him the master's title. In the objectives and content of a Master's degree module it must be clear that teaching and assessment of students aims at reaching the goals set in the Dublin descriptors. They are as follows.

Students to whom a Master's degree is awarded:

- Have demonstrated knowledge and understanding that is founded upon and extends and/or enhances that typically associated with Bachelor's level, and that provides a basis

or opportunity for originality in developing and/or applying ideas, often within a research[1] context;
- Can apply their knowledge and understanding, and problem solving abilities in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their field of study;
- Have the ability to integrate knowledge and handle complexity, and formulate judgements with incomplete or limited information, but that include reflecting on social and ethical responsibilities linked to the application of their knowledge and judgements;
- Can communicate their conclusions, and the knowledge and rationale underpinning these, to specialist and non-specialist audiences clearly and unambiguously;
- Have the learning skills to allow them to continue to study in a manner that may be largely self-directed or autonomous.

Domain specific contents, the nature of Master degree modules

The Master's degree module will build upon knowledge and understanding at undergraduate level. The core of this knowledge and understanding is as described by the Joint Task Force for Computing Science Curricula of ACM/IEEE-CS in their (draft) report "Computing Science Curricula 2013" (http://cs2013.org). The contents of the Master's degree programme should lead the student towards the frontiers of design and applications in the field, and/or towards the major research issues in the field.
The students in the Master's degree module will generally concentrate on subjects in a limited specialisation within the field, or in the border region with adjacent fields. If the module borders on adjacent fields (Management Sciences, Electrical Engineering and Telecommunication, Cognitive Science, …) it will meet international standards which are not necessarily only the standards set for Computing Science Curricula. In particular such modules have identified a (international) community of modules of a similar nature and they will fit the standards of that community.
The Master's degree module may not aim at educating students to be researchers, or it may have tracks for students who do not aim at such a goal. There is however always a strong relationship between the degree module and research activities, and researchers are active as lecturers and supervisors in the degree module.
Even if a student who is awarded the degree is not trained to be a researcher, he will have a basic understanding of the nature of research, and he will have proven research skills. In each degree module there will be a final project that takes at least one quarter of the entire module. In the final project the student can show his capabilities in each of the five fields of the Dublin descriptors (knowledge and understanding, application of knowledge and understanding, forming judgments, communication and learning skills).

Preparation for a further career in a PhD position or as a highly qualified professional in the field

A talented and successful student in the Master degree module must be educated to a level where he is eligible for a PhD-position. Participation in research projects, especially during the final project must be open to such students.
The Master's degree module must address the development of skills and competencies that are essential for a working professional. It must be possible for students to participate in

[1] research' is used to cover a wide variety of activities, with the context often related to a field of study; the term is used here to represent a careful study or investigation based on a systematic understanding and critical awareness of knowledge.

cooperation with trade and industry, in particular during a final project. This requires the modules to have sufficient contacts within trade and industry.

Comparison of 3TU academic criteria by Meijers at al. (2005) and the Domain Specific Frame of Reference for Computer Science (Version dated 14 Nov 2012).

3TU academic criteria	**Domain Specific Frame of Reference**
Competency in one or more scientific disciplines	Demonstrates knowledge and understanding that is founded upon and extends and/or enhances that typically associated with the Bachelor's degree level and that provides a basis or opportunity for originality in developing and/or applying ideas, often within a research context
Competency in conducting research	Can apply knowledge, understanding and problem-solving abilities in new or unfamiliar environments within broader (or multidisciplinary) contexts related to the specific field of study
Competency in designing	Can apply knowledge, understanding and problem-solving abilities in new or unfamiliar environments within broader (or multidisciplinary) contexts related to the specific field of study
Scientific approach	See competency in research and designing
Competency in cooperation and communication	Can communicate conclusions, as well as the underlying knowledge and rationale, clearly and unambiguously to specialised and non-specialised audiences
Basic intellectual skills	Has the learning skills needed in order to continue to study in a manner that is largely self-directed or autonomous
Consideration of the temporal and the social context	Has the ability to integrate knowledge, handle complexity and formulate judgements with incomplete or limited information, while reflecting on social and ethical responsibilities associated with the application of knowledge and judgements

Appendix 3: Intended learning outcomes

Bachelor programme Computer Science

1. Heeft een gedegen theoretische en praktische basiskennis van de informatica die toereikend is om met succes een masteropleiding op het terrein van de informatica te volgen, of toe te treden tot de arbeidsmarkt. De kennis omvat de gebieden genetwerkte systemen, formele methoden, en software engineering.
2. Heeft kennis gemaakt met onderzoek en ontwikkeling op het gebied van informatica op een wetenschappelijk niveau en met de daarvoor benodigde wetenschappelijke vaardigheden, en heeft met deze vaardigheden geoefend en daarvan een proeve van bekwaamheid afgelegd.
3. Heeft ervaring opgedaan met de praktische vaardigheden die deel uitmaken van de informatica, en is in staat deze toe te passen in concrete en gangbare professionele situaties. Hieronder valt het omgaan met gereedschappen om (genetwerkte) computergebaseerde systemen te modelleren, samen te stellen, uit te rollen, en te evalueren.
4. Is zich bewust van de rol van de informatica in de maatschappij, met inbegrip van de hieraan verbonden ethische aspecten, alsmede van de ontwikkeling van de informatica en het wetenschappelijk karakter van de informatica, en is in staat dit bewustzijn te gebruiken in reflectie op het denken en handelen.
5. Is in staat projectmatig te werken, waaronder te participeren in een multidisciplinair team, en heeft een open attitude in de exploratieve ontwikkeling van complexe systemen.
6. Is in staat professioneel en wetenschappelijk te communiceren, waaronder het formuleren van doelen, de selectie van geschikte middelen (technologie), en de definitie van projecten en onderzoeksplannen.
7. Is bekend met empirische aspecten van de informatica, vooral het evalueren van allerlei systemen, zowel in kwalitatieve als kwantitatieve zin.
8. Is in staat resultaten helder en beknopt weer te geven, zowel in de vorm van een schriftelijke (al dan niet wetenschappelijke) rapportage, alsmede door een mondelinge presentatie.
9. Bezit de leervaardigheden die nodig zijn voor het met succes volgen van een wetenschappelijke masteropleiding, en heeft aangetoond probleemanalyserend en oplossend te kunnen optreden.

Master programme Computer Science

A graduate with a VU Master Diploma in Computer Science is expected to:

1. Possess a solid academic knowledge and insight in the field of computer science, including the required background knowledge from other disciplines, which builds upon and goes beyond the level of a Bachelor of Science
2. Have knowledge, insight and skills of a specialist nature in at least one area of computer science (additional requirements to be given for each specialisation separately)
3. Be able to acquire specialist knowledge, insights and skills in other areas in computer science within a reasonable period of time
4. Have acquired practical skills in relevant sub areas of the field of computer science at an academic level
5. Be aware of the applications of computer science in general and of the chosen specialisation in particular and be able to apply his/her knowledge and skills to new or otherwise unknown problems

6. Be capable of designing a research or project plan on the basis of a realistic problem description in the field of computer science and to contribute to its progress with original solutions
7. Be able to consult and use the (international) professional literature in the relevant sub areas of the field of computer science
8. Be able to formulate, analyse and evaluate scientific results, and to use them to draw conclusions
9. Be able to function in professional situations where scientific knowledge and skills in computer science are required
10. Have developed a critical, scientific attitude and to be aware of the societal aspects of information technology
11. Be able to communicate with others at a professional level and to give a clear oral and written presentation of the results of his/her work
12. Be well prepared for a scientific education at the level of PhD or for further post-academic education as a professional computer scientist.

The Master programme in Computer Science offers six specialisations.

IWT	Internet and Web Technology
HPDC	High Performance Distributed Computing
SE	Software Engineering
MM	Multimedia
FMSV	Formal Methods and Software Verification
TAI	Technical Artificial Intelligence

Each of these specialisations has its own specific set of requirements, on top of the general requirements listed above.

Beyond the general requirements of a Computer Science Master, the graduate of Internet and Web Technology is expected to:

IWT1. Have proficiency in computer systems, notably in the form of capabilities for designing networked systems and with emphasis on efficient information processing (rather than on high-performance computing)

IWT2. Understand the essential elements of security, and to be able to apply security techniques that will enforce a given set of security requirements (However, we do not expect students to be security experts, which we consider to be a highly specialised profession by itself)

IWT3. Be able to easily program large and complex pieces of (possibly low-level) systems-oriented software

IWT4. Be able to set up and conduct experiments on networked applications and distributed systems, and have proficiency in discrete sys- tems simulation and emulation techniques, and be able to properly interpret data that result from such experiments.

Beyond the general requirements of a Computer Science Master, the graduate High Performance Distributed Computing is expected to:

HPDC1. Have proficiency in parallel and distributed computing systems and their relationship with computational science

HPDC2. This with a strong emphasis on performance and efficiency of its application programs and the related runtime systems and middle- ware services

HPDC3. Be able to conduct experiments as a means for the analysis of such systems.

Beyond the general requirements of a Computer Science Master, the graduate Software Engineering is expected to:

SE1. Be able to reconcile conflicting project objectives, finding acceptable compromises within limitations of cost, time, knowledge, existing systems, and organisations
SE2. Demonstrate an understanding of and apply current theories, models and techniques that provide a basis for decision making on IT investment issues, problem identification and analysis, software architecture, software design, development, implementation, testing, docu- mentation and re-engineering
SE3. Demonstrate an understanding and appreciation of the importance of negotiation, effective work habits, leadership, and good communication with stakeholders in a typical software development environment.

Beyond the general requirements of a Computer Science Master, the graduate of Multimedia is expected to:

MM1. Possess basic knowledge and skills in visual design
MM2. Have awareness of the context of applications, such as cultural heritage
MM3. Have detailed knowledge of advanced multimedia technology
MM4. Have experience with digital media tools and presentation platforms.

Beyond the general requirements of a Computer Science Master, the graduate of Formal Methods and Software Verification is expected to:

FMSV1. Have awareness of design methods for distributed systems
FMSV2. Be capable of formally specifying a software system
FMSV3. Be able to apply and have in-depth knowledge of automated verification methods and tools during system design
FMSV4. Possess knowledge of theoretical computer science, in particular term rewriting, process algebra, and type theory.

Beyond the general requirements of a Computer Science Master, the graduate of Technical Artificial Intelligence is expected to acquire knowledge, competences, and insight on:

TAI1. TAI-1 Methods for designing AI systems, like knowledge-based systems and multi-agent systems
TAI2. TAI-2 Techniques for searching and optimisation, like evolutionary algorithms and neural networks
TAI3. TAI-3 The architecture and operation of AI systems.

Master programme Parallel and Distributed Computer Systems

After graduation, the Master student in Parallel and Distributed Computer Systems is expected to:

1) possess both solid academic and specialist knowledge and insight in the field of Parallel and Distributed Computer Systems, including computer systems, programming, operating systems, computer networks, data structures, the theoretical foundations of communication systems, and system security, beyond that of a BSc;
2) be able to acquire specialist knowledge, insights and skills in other areas in computer science within a reasonable period of time;
3) have acquired practical skills in relevant sub-areas of the field of computer science at an academic level;

4) be aware of the applications of computer science in general and of Parallel and Distributed Computer Systems in particular and be able to apply his/ her knowledge and skills to new or otherwise unknown problems;
5) be capable of designing a research or project plan on the basis of a realistic problem description in the field of computer science;
6) be able to perform research work independently, both individually and in small teams;
7) be able to consult and use the (international) professional literature in the relevant sub-areas of the field of computer science;
8) be able to formulate, analyse and evaluate scientific results, and to use them to draw conclusions;
9) be able to function at professional positions where scientific knowledge and skills in computer science are required;
10) have developed a critical, scientific attitude and to be aware of the societal aspects of information technology;
11) be able to communicate with others at a professional level and to give a clear oral and written presentation of the results of his/her work;
12) be well prepared for a scientific education at the level of PhD or for further post-academic education as a professional computer scientist.

Appendix 4: Overview of the curricula

Bachelor's programme

		EC	period
Year 1	Introduction	3	1
	Problem Solving	3	1
	Computer Networks	6	1
	Pervasive Computing	6	2
	Programming (JAVA)	6	2
	Web Technology	6	3
	Logic and Sets	6	4
	Computer Systems	6	4
	Networks and Graphs	6	5
	Academic English	6	5
	Project Application Development	6	6
Year 2	Datastructures and Algorithms	6	1
	Advanced Programming	6	1
	Empirical Methods	6	2
	Logic and Modelling	6	2
	Intelligent Systems	6	3
	Databases	6	4
	Computer Systems	6	4
	History of Science	3	5
	Societal Aspects	3	5
	Philosophy	3	5
	Software Modelling	6	5
	Human-Computer Interaction	6	6
Year 3	MINOR	30	1-3
	Machine Learning	6	4
	Automata and Complexity	6	4
	Bachelor Project	18	5-6

Master's programme Computer Science

Course	ECTS	Period
Advanced Logic	6	4
Cluster and Grid Computing	6	4
Coding and Cryptography	6	1
Computer and Network Security	6	5
Computer Graphics	6	2 + 3
Computer Networks Practical	6	5 + 6
Compiler Construction (UvA)	6	4
Concurrency and Multithreading	6	1
Concurrency Theory (UvA)	6	1
Concurrent System Design by Abstraction (UvA)	6	4 + 5
Distributed Algorithms	6	2
Distributed Multimedia Systems	6	4
Distributed Systems	6	2
Evolutionary Computing	6	1
Experimental Design and Data Analysis	6	5
Internet Programming	6	1
Individual Systems Practical	6	any
Intelligent Web Applications	6	4
Knowledge and Media	6	2
Knowledge Engineering	6	2 + 3
Literature Study	6	any
Logical Verification	6	5
Master Project	36	any
Model-based Intelligent Environments	6	3
Multimedia Authoring	6	1
Neural Networks	6	1
Operating Systems Practical	6	5 + 6
Parallel Programming	6	1
Parallel Programming Practical	6	2 + 3
Protocol Validation	6	5
Service Oriented Design	6	1
Serious Games	6	1
Software Architecture	6	2
Software Asset Management	6	1
Software Configuration Management	6	4
Software Testing	6	5
Visual Analytics	6	4 + 5
The Social Web	6	4
Term Rewriting Systems	6	2

Master programme Parallel and Distributed Computer Systems

YEAR 1		
	Compulsory Courses	
2	Cluster and Grid Computing	6
2	Computer and Network Security	6
1	Distributed Systems	6
1	Parallel Programming	6
	Compulsory Optional Courses Theoretical Computer Science	
1	Coding and Cryptography	6
1	Concurrency and Multithreading	6
1	Concurrency Theory	6
2	Distributed Algorithms	6
2	Protocol Validation	6
2	Logical Verification	6
	Compulsory Optional Courses Programming	
2	Compiler Construction	6
2	Computer Networks Practical	6
2	Operating Systems Practical	6
1	Parallel Programming Practical	6
1+2	PDCS Programming Project	12
YEAR 2		
	Compulsory Courses	
3	Adv. Topics in Comp. and Network Security	6
3	Advanced Topics in Distributed Systems	6
3	Research Proposal Writing	6
4	Master Project	36
	Optional Courses	
4	Advanced Logic	6
3	Binary and Malware Analysis	6
3	Computer Graphics	6
4	Computer Networking	6
3	Concurrent Programming	6
3	Evolutionary Computing	6
3+4	Industrial Internship	6
3	Internet programming	6
3	Performance Analysis of Comm. Networks	6
3+4	Scientific Writing in English	3
3+4	Selected Topics in PDCS	3
3+4	Selected Topics in PDCS	6
3	Term Rewriting Systems	6

Appendix 5: Quantitative data regarding the programmes

Bachelor programme Computer Science

Data on intake, transfers and graduates

Number of full time students enrolled per cohort in the Bachelor's programme Computer Science

Cohort	Total	Male	Female
02/ 03	41	39	2
03/ 04	29	25	4
04/ 05	25	25	
05/ 06	21	17	4
06/ 07	30	28	2
07/ 08	35	32	3
08/ 09	43	40	3
09/ 10	29	26	3
10/ 11	29	23	6
11/ 12	41	36	5
12/ 13	48	44	4

Total number of ful time students enrolled in the Bachelor's programme Computer Science

Year	Total	Male	Female
02/ 03	52	49	3
03/ 04	242	228	14
04/ 05	252	240	12
05/ 06	223	211	12
06/ 07	217	206	11
07/ 08	211	200	11
08/ 09	188	177	11
09/ 10	161	153	8
10/ 11	164	149	15
11/ 12	168	149	19
12/ 13	142	130	12

Number of graduated students in the Bachelor's programme Computer Science

Year	BSc
02/ 03	6
03/ 04	15
04/ 05	28
05/ 06	25
06/ 07	32
07/ 08	43
08/ 09	32
09/ 10	20
10/ 11	43
11/ 12	40

Teacher-student ratio achieved

The number of students in the Bachelor Computer Science is 142 (March 2013). In this programme 37 staff and student assistants are involved resulting in 14.3 teaching fte. The staff members also teach in other curricula.

Average amount of face-to-face instruction per stage of the study programme

	contact hours / week			
	lecture	**work group**	**lab**	**total**
Introduction	2	2		4
Problem Solving	2		4	6
Computer Networks	2	4		6
Pervasive Computing	4		2	6
Programming (JAVA)	6		6	12
Web Technology	8		16	24
Logic and Sets	4	6		10
Computer Systems	4	4		8
Networks and Graphs	4	4		8
Academic English	2	2		4
Project Application Development				0
Datastructures and Algorithms	4	6		10
Advanced Programming	4			4
Empirical Methods	4	2	2	8
Logic and Modelling	4	4	1	9
Intelligent Systems	8	16		24
Databases	4		4	8
Computer Systems	4		4	8
History of Science	2			2
Societal Aspects	2			2
Philosophy	2			2
Software Modelling	2	4		6
Human-Computer Interaction	4	4		8
MINOR				
Machine Learning	2		2	4
Automata and Complexity	4	4		8
Bachelor Project				0

Master's programme Computer Science

Data on intake, transfers and graduates

Table 1 Number of full time students enrolled per cohort in the master's programme Computer Science

Cohort	Total	Male	Female
02/ 03	13	12	1
03/ 04	26	19	7
04/ 05	46	36	10
05/ 06	49	44	5
06/ 07	53	45	8
07/ 08	61	59	2
08/ 09	71	55	16
09/ 10	53	47	6
10/ 11	65	57	14
11/ 12	57	52	5
12/ 13	38	30	8

Total number of ful time students enrolled in the master's programme Computer Science

Year	Total	Male	Female
02/ 03	8	7	1
03/ 04	27	22	5
04/ 05	46	36	10
05/ 06	74	63	11
06/ 07	85	74	11
07/ 08	100	93	7
08/ 09	143	124	19
09/ 10	141	120	21
10/ 11	141	116	25
11/ 12	141	121	20
12/ 13	143	120	23

Number of graduated students in the master's programme Computer Science

Year	MSc
02/ 03	
03/ 04	14
04/ 05	24
05/ 06	28
06/ 07	35
07/ 08	29
08/ 09	56
09/ 10	47
10/ 11	48
11/ 12	39

Teacher-student ratio achieved

The 38 people (10 fte-teaching) who teach in the Computer Science master's programme with in total 143 students (March 2013) also contribute to the bachelor's programme Computer Science.

Average amount of face-to-face instruction per stage of the study programme

Courses are scheduled in a semester of two periods of eight weeks and a third and final period of four weeks. Generally master courses have four hours a week of class sesssions and sometimes additional practical sessions.

Master's programme Paralell and Distributed computer systems

Data on intake, transfers and graduates

Number of full time students enrolled per cohort in the master's programme PDCS

Cohort	Total	Male	Female	from NL	from abroad
04/ 05	9	7	2	1	8
05/ 06	12	11	1	2	10
06/ 07	10	9	1	3	7
07/ 08	9	8	1	2	7
08/ 09	16	13	3	3	13
09/ 10	11	10	1	2	9
10/ 11	22	14	8	3	19
11/ 12	11	10	1	1	10
12/ 13	19	15	4	-	19

Total number of ful time students enrolled in the master's programme PDCS

Year	Total	Male	Female
04/ 05	9	7	2
05/ 06	20	17	3
06/ 07	18	16	2
07/ 08	20	18	2
08/ 09	31	26	5
09/ 10	32	28	4
10/ 11	39	29	10
11/ 12	28	25	3
12/ 13	29	25	4

Number of graduated students in the master's programme PDCS

Year	MSc
04/ 05	
05/ 06	7
06/ 07	7
07/ 08	4
08/ 09	8

09/ 10	11
10/ 11	24
11/ 12	15

Teacher-student ratio achieved

The number of students in the master programme PDCS is 29 (March 2013). In this programme 21 staff are involved (4.4 teaching fte). They also teach in other curricula.

Average amount of face-to-face instruction per stage of the study programme

Students in the PDCS programme are studying mostly in interactive forms of tuition.

Appendix 6: Programme of the site visit

Dag 1 Woensdag	**16 oktober**	**Locatie VU**
9.00	10.30	Voorbereidend overleg commissie + inzage documenten
10.30	11.00	Management VU en UvA (bestuurlijk verantwoordelijken: decanen en onderwijsdirectie) VU: • Irth, • Vermeer, • Van Steen UvA BSc IN en MSc GC/CLS: • Karel Jan Schoutens (Decaan FNWI), • Michel Haring (Directeur Onderwijs FNWI), • Jan Bergstra (Directeur IvI) • Andy Pimentel (Directeur Graduate School of Informatics FNWI), • Jeroen Goedkoop (Directeur College of Science FNWI)
11.00	11.45	Opleidingsmanagement Masteropleidingen VU en UvA VU: • Fokkink, • Schreiber UvA MSc GC/CLS: • Jaap Kaandorp (Opleidingsdirecteur MSc GC/CLS, FNWI), • Alban Ponse (Coördinator MSc GC/CS, FNWI), • Kristien van Lunen (Opleidingscoördinator MSc GC/CLS, FNWI) Opleidingsmanagement Bachelor-opleiding VU: opleidingsdirecteur VU: • Fokkink, • Schreiber
11.45	13.00	Lunch, open spreekuur
13.00	14.00	Docenten Bacheloropleiding VU
14.00	15.00	Studenten Bacheloropleiding VU
15.00	15.15	Break
15.15	16.15	Studenten Masteropleidingen VU
16.15	17.00	Alumni VU (Ba en Ma)
17.00	17.30	Eventueel rondleiding / intern overleg commissie
19.30		Diner (alleen voor cie. regelt Qanu)

Dag 2 Donderdag	**17 oktober**	
9.00	10.00	Docenten Masteropleidingen VU
10.00	10.30	Opleidingscommissie VU
10.30	11.15	Examencommissies en Studieadviseur(s) VU (Ba en Ma)
11.15	11.45	Vervoer naar UvA Locatie UvA

12.00	14.00	Lunch en inzage documenten en eventueel rondleiding
14.00	14.30	Opleidingsmanagement Bacheloropleiding UvA UvA BSc IN: • Robert Belleman (Opleidingsdirecteur BSc IN, FNWI), • Babette Sluijter (Opleidingscoördinator BSc IN, FNWI)
14.30	15.30	Docenten Bacheloropleiding UvA UvA BSc IN: • José Lagerberg (Docent BSc IN, FNWI), • Leen Torenvliet (Docent BSc IN, FNWI), • Dick van Albada (Docent BSc IN, FNWI), • Clemens Grelck (Docent BSc IN, FNWI), • Inge Bethke (Docent BSc IN, FNWI) • (Robert Belleman, Docent BSc IN, FNWI: standby)
15.30	16.30	Studenten Bacheloropleiding UvA UvA BSc IN: • Aike van den Brink (Eerstejaars student BSc IN, FNWI) • Marcel Sang-Ajang (Eerstejaars student BSc IN, FNWI), • Tessa Klunder (Tweedejaars student BSc IN, FNWI) • Jordy Perlee (Tweedejaars student BSc IN, FNWI), • Mustafa Karaalioglu (Derdejaars student BSc IN, FNWI) • Robin de Vries (Derdejaars student BSc IN, FNWI)
16.30	17.15	Alumni UvA (Ba en Ma) UvA BSc IN: • Roy Bakker (Alumnus BSc IN, FNWI), • Pascal Mettes (Alumnus BSc IN, FNWI) • Koos van Strien (Alumnus BSc IN, FNWI) UvA MSc GC/CLS: • Narges Zarrabi (Alumnus MSc GC/CLS, FNWI) • Maxim Filatov (Alumnus MSc GC/CLS, FNWI) • - Roland Dries (Alumnus MSc GC/CLS, FNWI)
19.30		Diner (alleen voor commissie)

Dag 3 Vrijdag	**18 oktober**	
9.00	10.00	Docenten Masteropleiding UvA UvA MSc GC/CLS: • Rob Stevenson (docent MSc CLS, FNWI, KdV) • Alfons Hoekstra (docent MSc CLS, FNWI, IvI) • Johan Westerhuis (docent MSc CLS, FNWI, SILS) • Mike Lees (docent MSc CLS, FNWI, IvI) • Drona Kandhai (docent MSc CLS, FNWI, IvI) • Maarten van Steen (docent MSc CLS, VU) • Thilo Kielmann (docent MSc CLS, VU) • Jaap Kaandorp (docent MSc CLS, FNWI, IvI)
10.00	11.00	Studenten Masteropleiding UvA UvA MSc GC/CLS: • Merlijn Wajer (MSc Student CLS, 2012)

		• Amir Abdol (MSc Student CLS, 2012) • Camelia Simoiu (MSc Student CLS, 2013) • Merel de Groot (MSc Student CLS, 2013) • Philip Rutten (MSc Student CLS, 2013) • Elte Hupkes (MSc Student CLS, 2013) • Frank van Alphen (MSc Student CLS, 2013)
11.00	11.15	Break
11.15	11.45	Opleidingscommissie UvA (Ba en Ma) UvA BSc IN en MSc GC/CLS: • Toto van Inge (Voorzitter, BSc IN en MSc GC/CLS FNWI), • Tamara Ockhuijsen (Secretaris, BSc IN en MSc GC/CLS FNWI), • Rein van den Boomgaard (Docentlid, BSc IN, FNWI), • Alfons Hoekstra (Docentlid, MSc GC/CLS, FNWI), • Sammy Odenhoven (Studentlid, BSc IN, FNWI) • Jeroen Hofman (Studentlid, BSc IN, FNWI)
11.45	12.30	Examencommissie en Studieadviseurs UvA (Ba en Ma) UvA BSc IN en MSc GC/CLS: • Inge Bethke (Voorzitter, BSc IN en MSc GC/CLS, FNWI), • Dick van Albada (Lid ExCie, BSc IN en MSc GC/CLS, FNWI), • AFWEZIG IVM ZIEKTE: Brenda Wiefferink (Studieadviseur, BSc IN, FNWI) • Richard Kellermann (Studieadviseur, MSc GC/CLS, FNWI)
12.30	14.00	Lunch en open spreekuur
14.00	15.30	Voorbereiden eindgesprek met management
15.30	16.00	Eindgesprek met management VU en UvA (zowel bestuurlijk als inhoudelijk management) VU: • Irth, • Vermeer, • Van Steen • Fokkink • Schreiber UvA: • Karel Jan Schoutens (Decaan FNWI), • Michel Haring (Directeur Onderwijs FNWI), • Jan Bergstra (Directeur IvI) • Andy Pimentel (Directeur Graduate School of Informatics, FNWI), • Jeroen Goedkoop (Directeur College of Science, FNWI), • Robert Belleman (Opleidingsdirecteur BSc IN, FNWI), • Jaap Kaandorp (Opleidingsdirecteur MSc GC/CLS, FNWI), • Babette Sluijter (Opleidingscoördinator BSc IN, FNWI), • - Kristien van Lunen (Opleidingscoördinator MSc GC/CLS, FNWI)
16.00	16.30	Presentatie bevindingen en informele afsluiting

Appendix 7: Theses and documents studied by the committee

Prior to the site visit, the committee studied the theses of the students with the following student numbers:

Bachelor's programme Computer Science

1811258	1821881	2105896
2080443	1397176	1767100
1717677	2130823	1329219
1967843	1614614	2034433
2066734	0789097	1853449

Master's programme Computer Science

1821792	1615270	2116138
1623184	2206444	2509493
2001683	2115840	1823205

Master's programme Parallel Documented Computer Systems

2205889	1707299	2115786
2001047	2205860	2116243
2517148	2116928	2517061

During the site visit, the committee studied, among other things, the following documents (partly as hard copies, partly via the institute's electronic learning environment):

- Standard / basic books
- Tests, assessment criteria, assessment forms and answers
- Minutes of the Board of Examiners 2009-2011
- Minutes of het Educational committee 2009 – 2011
- Course evaluations

Appendix 8: Declarations of independence

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nederlands - vlaamse accreditatieorganisatie

ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM:
Dhr. Jan Paredaens

PRIVÉ ADRES:
K Karellaan 42
B-1982 ELEWIJT

IS ALS DESKUNDIGE (voorzitter) / ~~SECRETARIS~~ GEVRAAGD VOOR HET BEOORDELEN VAN DE OPLEIDING:

Informatica

AANGEVRAAGD DOOR DE INSTELLING:

TU Delft; Open Universiteit; Rijksuniversiteit Groningen; TU Eindhoven; Universiteit Utrecht, Radboud Universiteit, Universiteit Leiden; UvA/VU; Universiteit Twente

VERKLAART HIERBIJ GEEN (FAMILIE)RELATIES OF BANDEN MET BOVENGENOEMDE INSTELLING TE ONDERHOUDEN, ALS PRIVÉPERSOON, ONDERZOEKER / DOCENT, BEROEPSBEOEFENAAR OF ALS ADVISEUR, DIE EEN VOLSTREKT ONAFHANKELIJKE OORDEELSVORMING OVER DE KWALITEIT VAN DE OPLEIDING TEN POSITIEVE OF TEN NEGATIEVE ZOUDEN KUNNEN BEÏNVLOEDEN;

1

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nederlands - vlaamse accreditatieorganisatie

VERKLAART HIERBIJ ZODANIGE RELATIES OF BANDEN MET DE INSTELLING DE AFGELOPEN VIJF JAAR NIET GEHAD TE HEBBEN;

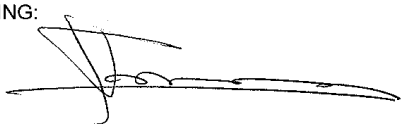
VERKLAART STRIKTE GEHEIMHOUDING TE BETRACHTEN VAN AL HETGEEN IN VERBAND MET DE BEOORDELING AAN HEM/HAAR BEKEND IS GEWORDEN EN WORDT, VOOR ZOVER DE OPLEIDING, DE INSTELLING OF DE NVAO HIER REDELIJKERWIJS AANSPRAAK OP KUNNEN MAKEN.

VERKLAART HIERBIJ OP DE HOOGTE TE ZIJN VAN DE NVAO GEDRAGSCODE.

PLAATS: Antwerpen

DATUM: 26.4.13

HANDTEKENING:



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nederlands - vlaamse accreditatieorganisatie

ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM: A. Bijlsma

PRIVÉ ADRES:

Maasvelderweg 22. 6229 XT Maastricht

IS ALS DESKUNDIGE / SECRETARIS GEVRAAGD VOOR HET BEOORDELEN VAN DE OPLEIDING:

B Informatica

M Computing Science

AANGEVRAAGD DOOR DE INSTELLING:

RU Groningen

VERKLAART HIERBIJ GEEN (FAMILIE)RELATIES OF BANDEN MET BOVENGENOEMDE INSTELLING TE ONDERHOUDEN, ALS PRIVÉPERSOON, ONDERZOEKER / DOCENT, BEROEPSBEOEFENAAR OF ALS ADVISEUR, DIE EEN VOLSTREKT ONAFHANKELIJKE OORDEELSVORMING OVER DE KWALITEIT VAN DE OPLEIDING TEN POSITIEVE OF TEN NEGATIEVE ZOUDEN KUNNEN BEÏNVLOEDEN;

1

nvao
nederlands - vlaamse accreditatieorganisatie

VERKLAART HIERBIJ ZODANIGE RELATIES OF BANDEN MET DE INSTELLING DE AFGELOPEN VIJF JAAR NIET GEHAD TE HEBBEN;

VERKLAART STRIKTE GEHEIMHOUDING TE BETRACHTEN VAN AL HETGEEN IN VERBAND MET DE BEOORDELING AAN HEM/HAAR BEKEND IS GEWORDEN EN WORDT, VOOR ZOVER DE OPLEIDING, DE INSTELLING OF DE NVAO HIER REDELIJKERWIJS AANSPRAAK OP KUNNEN MAKEN.

VERKLAART HIERBIJ OP DE HOOGTE TE ZIJN VAN DE NVAO GEDRAGSCODE.

PLAATS: Heerlen DATUM: 9-4-'13

HANDTEKENING: 

nvao

ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM: BART PRENGEL

PRIVÉ ADRES: PRINSES LYDIALAAN 54

B-3001 LEUVEN

BELGIE

IS ALS DESKUNDIGE / ~~SECRETARIS~~ GEVRAAGD VOOR HET BEOORDELEN VAN DE OPLEIDING:

INFORMATICA

AANGEVRAAGD DOOR DE INSTELLING:

VERKLAART HIERBIJ GEEN (FAMILIE)RELATIES OF BANDEN MET BOVENGENOEMDE INSTELLING TE ONDERHOUDEN, ALS PRIVÉPERSOON, ONDERZOEKER / DOCENT, BEROEPSBEOEFENAAR OF ALS ADVISEUR, DIE EEN VOLSTREKT ONAFHANKELIJKE OORDEELSVORMING OVER DE KWALITEIT VAN DE OPLEIDING TEN POSITIEVE OF TEN NEGATIEVE ZOUDEN KUNNEN BEÏNVLOEDEN;

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nederlands - vlaamse accreditatieorganisatie

VERKLAART HIERBIJ ZODANIGE RELATIES OF BANDEN MET DE INSTELLING DE AFGELOPEN VIJF JAAR NIET GEHAD TE HEBBEN;

VERKLAART STRIKTE GEHEIMHOUDING TE BETRACHTEN VAN AL HETGEEN IN VERBAND MET DE BEOORDELING AAN HEM/HAAR BEKEND IS GEWORDEN EN WORDT, VOOR ZOVER DE OPLEIDING, DE INSTELLING OF DE NVAO HIER REDELIJKERWIJS AANSPRAAK OP KUNNEN MAKEN.

VERKLAART HIERBIJ OP DE HOOGTE TE ZIJN VAN DE NVAO GEDRAGSCODE.

PLAATS: Leuven

DATUM: 25 juli 2013

HANDTEKENING:

nvao

ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM: Sjouke Mauw

PRIVÉ ADRES:

20, RUE TH. GILLEN
L-1625 HOWALD LUXEMBURG

IS ALS DESKUNDIGE / SECRETARIS GEVRAAGD VOOR HET BEOORDELEN VAN DE OPLEIDING:

INFORMATICA

AANGEVRAAGD DOOR DE INSTELLING:

VSNU / QANU
RUG, TU6, UU, UvA, VU

VERKLAART HIERBIJ GEEN (FAMILIE)RELATIES OF BANDEN MET BOVENGENOEMDE INSTELLING TE ONDERHOUDEN, ALS PRIVÉPERSOON, ONDERZOEKER / DOCENT, BEROEPSBEOEFENAAR OF ALS ADVISEUR, DIE EEN VOLSTREKT ONAFHANKELIJKE OORDEELSVORMING OVER DE KWALITEIT VAN DE OPLEIDING TEN POSITIEVE OF TEN NEGATIEVE ZOUDEN KUNNEN BEÏNVLOEDEN;

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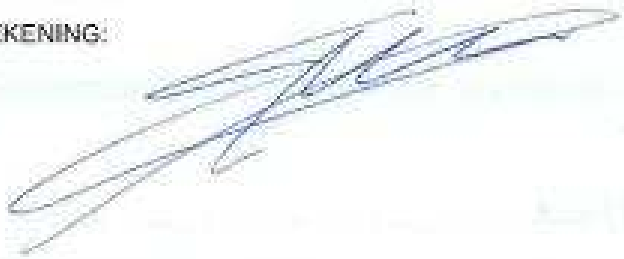
VERKLAART HIERBIJ OP DE HOOGTE TE ZIJN VAN DE NVAO GEDRAGSCODE.

PLAATS: Luxemburg DATUM: 3/4/13

HANDTEKENING:



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ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM: Ruud Valkij (Ruud Verbij)

PRIVÉ ADRES: Borstelweg 40, Enschede

IS ALS DESKUNDIGE / ~~SECRETARIS~~ GEVRAAGD VOOR HET BEOORDELEN VAN DE OPLEIDING:

alle informatica (BSc en MSc) aan:

AANGEVRAAGD DOOR DE INSTELLING:

UVA/Vu, OU, TU Delft, UU,

VERKLAART HIERBIJ GEEN (FAMILIE)RELATIES OF BANDEN MET BOVENGENOEMDE INSTELLING TE ONDERHOUDEN, ALS PRIVÉPERSOON, ONDERZOEKER / DOCENT, BEROEPSBEOEFENAAR OF ALS ADVISEUR, DIE EEN VOLSTREKT ONAFHANKELIJKE OORDEELSVORMING OVER DE KWALITEIT VAN DE OPLEIDING TEN POSITIEVE OF TEN NEGATIEVE ZOUDEN KUNNEN BEÏNVLOEDEN;

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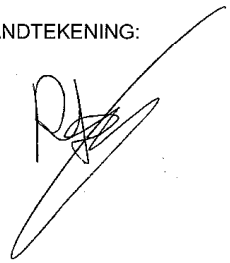
VERKLAART HIERBIJ OP DE HOOGTE TE ZIJN VAN DE NVAO GEDRAGSCODE.

PLAATS: Antwerpen.

DATUM: 26-4-13

HANDTEKENING:



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ONAFHANKELIJKHEIDS- EN GEHEIMHOUDINGSVERKLARING

INDIENEN VOORAFGAAND AAN DE OPLEIDINGSBEOORDELING

ONDERGETEKENDE

NAAM: BARBARA VAN BALEN

PRIVÉ ADRES:

KLEINE Houtweg 8 2012 CH
Haarlem

IS ALS ~~DESKUNDIGE~~ / SECRETARIS GEVRAAGD VOOR HET BEOORDELEN VAN DE OPLEIDING:

Informatica

AANGEVRAAGD DOOR DE INSTELLING:

VERKLAART HIERBIJ GEEN (FAMILIE)RELATIES OF BANDEN MET BOVENGENOEMDE INSTELLING TE ONDERHOUDEN, ALS PRIVÉPERSOON, ONDERZOEKER / DOCENT, BEROEPSBEOEFENAAR OF ALS ADVISEUR, DIE EEN VOLSTREKT ONAFHANKELIJKE OORDEELSVORMING OVER DE KWALITEIT VAN DE OPLEIDING TEN POSITIEVE OF TEN NEGATIEVE ZOUDEN KUNNEN BEÏNVLOEDEN;

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VERKLAART HIERBIJ OP DE HOOGTE TE ZIJN VAN DE NVAO GEDRAGSCODE.

PLAATS: Utrecht DATUM: 26 april 2013

HANDTEKENING: