UNIVERSITY OF AMSTERDAM

FACULTY OF SCIENCE

EDUCATION AND EXAMINATION REGULATIONS

PART B: programme-specific section

Academic year 2014-2015

MASTER'S PROGRAMME COMPUTATIONAL SCIENCE

Chapter 1. General Provisions

Article 1.1 – Definitions
In addition to part A, the following definitions are used in part B
Personal Education Plan An individual study plan for the student's Master programme.

Article 1.2 – Study programme information
1. The Master's programme Computational Science, CROHO number 60299, is offered on a full-time basis and the language of instruction is English. This means that the Code of Conduct for Foreign Languages at the UvA applies for this programme (see Code of Conduct Governing Foreign Languages at the University of Amsterdam 2000 at the website: http://www.uva.nl/en/about-the-uva/uva-profile/rules-and-regulations/teaching/teaching.html).
2. The programme consists of a two-year programme with a total study load of 120 EC.
3. Students have to consult the programme director for the contents of their individual study programme by filling in their Personal Education Plan (PEP). A standard PEP contains components offered by the Master's programme (see Appendix 1), and Graduation Research. Any changes in the standard PEP have to be approved by the programme director. A PEP form has to be submitted to the programme director and the Examinations Board for prior approval.

Article 1.3 – Enrolment
The programme is offered starting in the first semester of the academic year (1 September).

Chapter 2. Programme objectives and exit qualifications

Article 2.1 – Programme objectives
The objectives of the Master Computational Science programme at the University of Amsterdam are as follows:
1. To educate students at an academic level to the degree of Master of Science in Computational Science, in order to become active members of the scientific research community in academic institutions as well as in advanced research and development environments.
2. To attain a final level of knowledge and academic skills that will grant access to PhD. programmes in the Computational Sciences or to other scientific research oriented positions.

Article 2.2 – Exit qualifications
The Exit qualifications of the Master's Programme Computational Science are defined as follows:
1. The graduate in Computational Science has a thorough knowledge of modelling and simulation of complex systems, computational methods and techniques and the application of computational methodologies in application fields (ranging from e.g. physics or biology to medical sciences or psychology).
2. The graduate is able to contribute to scientific research in the field of the degree course.
3. The graduate can formulate and solve problems with the aid of abstraction and model forming.
4. The graduate is able to formulate problems both in general terms and in mathematical and technical terms.
5. The graduate is able to clearly express himself/herself both orally and in writing.
6. The graduate is able to analyse, design and implement as part of a team.
7. The graduate has given thought to the social context of the exercise of science in general and the application of computer science in particular.
8. The graduate is able to independently acquire the information and concepts that are necessary when starting up a new project.

Chapter 3. Further admission requirements

Article 3.1 – Admission requirements
Admission to the Master's Programme in Computational Science may be granted to all students holding an academic Bachelor degree in one of the Sciences or Engineering disciplines. Candidates for the programme should demonstrate sufficient knowledge in mathematics, modelling & simulation and computing skills before they will be admitted to the programme. An intake procedure will be undertaken for each individual candidate.

Article 3.2 – Pre-Master's programme
Not applicable

Article 3.3 – Limited programme capacity
Not applicable.

Article 3.4 – Final deadline for registration
1. A request for admission to the Master's programme must be submitted to StudieLink and the Faculty before 1 May in the case of Dutch students, before 1 April in the case of EU students and before 1 February in the case of non-EU students.
2. Under exceptional circumstances, the Examinations Board may consider a request submitted after this closing date.

Article 3.5 – English language requirements
1. The proficiency requirement in English as the language of instruction can be met by the successful completion of one of the following examinations or an equivalent:
    1. IELTS-test: minimum score 6.5, at least 6 on each sub-score (listening/reading/writing/speaking).
    2. TOEFL Test: the minimum scores required are:
        - Internet-based test (iBT): 90
        - Computer-based test (CBT): 235
        - Paper-based test (PBT): 580

        The TOEFL-code for the Faculty of Science of the Universiteit van Amsterdam is: 8628.
    3. A Cambridge Examination Score with a minimum test result of CAE B will also be accepted. For the CPE test a minimal score of C is required.
2. Those possessing a Bachelor's degree from a Dutch university or have an English-language 'international baccalaureate' diploma satisfy the requirement of sufficient command of the English language.

Article 3.6 – Free curriculum
1. Subject to certain conditions, the student has the option of compiling a curriculum of his/her own choice which deviates from the curricula prescribed by the programme.
2. The concrete details of such a curriculum must be approved beforehand by the Examinations Board of the master's programme.
3. The free curriculum is put together by the student and must at least have the size, breadth and depth of a regular Master's programme.
4. The following conditions must at least have been met in order to be eligible for the Master's degree:
    1. at least 36 EC must be obtained from the regular curriculum.
    2. the level of the programme must match the objectives and exit qualifications that apply for the programme for which the student is enrolled.

Chapter 4. Curriculum structure

Article 4.1 – Composition of programme

1. Computational Science focuses on systems for quantitative modelling and simulation of complex dynamic systems. These are found in, e.g., physics, chemistry and engineering.
   The curriculum comprises the following:
   1. Compulsory components: 84 EC (36 - 42 EC on components in year 1 and 48 EC on components in year 2, including the Graduation Research – Computational Science of 36 EC in year 2);
   2. Constrained choice components: 18 - 24 EC (year 1);
   3. Elective components: 12 EC (year 2). Elective components enable the student to attend Master components not already mentioned as constrained choice components. Elective components will be chosen with the consent of the Examinations Board.
2. A complete list of components provided by the Master's programme can be found in Appendix 1.
3. Within the programme Computational Science students can choose elective components in the following application domains:
   1. Computational Finance/Economics
   2. Computational Biology
   3. Computational Chemistry
   4. Computational Earth Sciences
   5. Scientific Computing, Numerical Mathematics
4. Every component will be tested. Within the Master's programme Computational Science different types of testing are used. This is described per component in the course catalogue.
5. Within the Master's programme Computational Science different types of teaching methods are used. This is described per component in the course catalogue.

Article 4.2 – Compulsory components

Compulsory Components	
Year 1	**42 - 48 EC required**
Both these components: 1. Numerical Algorithms (UvA) 2. Introduction to Computational Science (UvA)* * Students with sufficient prior knowledge can replace this component with an additional constrained choice component.	 6 6
One out of: 1. Distributed Systems (VU) 2. Stochastic Simulation (UvA)	 6 6
One out of: 1. Biosystems Data Analysis (UvA) 2. Heuristics (VU)	 6 6
One out of: 1. Scientific Computing (UvA) 2. Performance of Networked Systems (VU)	 6 6
One out of: 1. Large-Scale Computing Infrastructures (VU) 2. Experimental Design and Data Analysis (VU)	 6 6
Complex System Simulation	6

Seminars Computational Science (UvA)* * This component runs over year 1 and 2; EC credits are given at the end of year 2.	6
Year 2	**42 EC required**
Literature Study	6
Graduation Research – Computational Science	36

Constrained Choice Components, **from which at least (3-)4 components must be chosen**	**18 - 24 EC required**
Concurrency and Multithreading (VU)	6
Neural Networks (VU)	6
Evolutionary Computing (VU)	6
Internet Programming (VU)	6
Scientific Visualisation & Virtual Reality (UvA)	6
Advanced Self Organisation (VU)	6
Machine Learning (VU)	6
Intelligent Web Applications (VU)	6
The Social Web (VU)	6
Data Mining Techniques (VU)	6

Article 4.3 – Practical exercise
In addition to, or instead of, classes in the form of lectures, the elements of the Master's programme often include a practical component as defined in article 1.2 of part A.

Article 4.4 – Elective components

Elective Components	**12 EC required**
Application domain **Computational Science Theory**: - course choices in consultation with the Programme Director	
Application domain **Computational Finance/Economics**: (course choices in consultation with the Programme Director) - Stochastic Processes for Finance (VU) - Non-linear Economic Dynamics (UvA) - Bounded Rationality (UvA) - Stochastic Calculus (UvA) - Computational Finance (UvA) - International Financial Economics (UvA) - Advanced Topics in Computational Finance (UvA)	 6 5 5 5 6 5 6
Application domain **Computational Biology**: (course choices in consultation with the Programme Director) - Fundamentals of Bioinformatics (VU) - Bioinformatics I (UvA) - Algorithms in Sequence Analysis (VU) - Computational Biology (UvA) - Bioinformatics II (UvA) - Bioinformatics for Translational Medicine (VU)	 6 6 6 6 6 6

Application domain **Computational Chemistry**: (course choices in consultation with the Programme Director) - Statistical Theory of Complex Molecular Systems (UvA) - Understanding Molecular Simulation (UvA) - Biomolecular Simulations (UvA)	 6 6 6
Application domain **Computational Earth Sciences**: - course choices in consultation with the Programme Director	
Application domain **Scientific Computing, Numerical Math**: - course choices in consultation with the Programme Director	

1. An elective component will only be seen as part of the programme if the Examinations Board has given its prior approval.
2. In terms of content, elective components must not show too much similarity to the components of the student's standard curriculum. The acceptable degree of similarity will be decided by the Examinations Board.
3. The Examinations Board may permit the choice of one or more components from other university-level Master's Programmes.
4. Elective components can also be used to make up for deficiencies. In this case this choice is not completely free. The programme director may decide to limit the elective components and suggest a constrained choice component or compulsory component.

Article 4.5 – Sequence of examinations

1. The student may start with the final project of the study programme (Graduation Research) only if all other obligations, as stated in Article 4.2, have been fulfilled and the study programme has been approved by the Examinations Board.
2. In exceptional cases, the Examinations Board may, at the student's reasoned request, deviate from the order mentioned in paragraph 1 of this article, with or without stipulating conditions.
3. The assessment of projects in which several students have worked on an assignment will only be made at the end of the relevant teaching period. In principle, an individual resit is not possible.
4. If a student feels that on account of exceptional circumstances the assessment, referred to in paragraph 2, is not a realistic assessment of his/her effort, knowledge, skills or insights, the student may request the Examinations Board to nevertheless permit an individual test and/or resit.

Article 4.6 – Participation in practical exercise and study group sessions

Not applicable.

Article 4.7 – Maximum exemption

Not applicable.

Article 4.8 – Validity period of examinations

The validity period of interim examinations and exemptions from interim examinations is limited, as described in part A, article 4.8.

Article 4.9 – Degree

Students who have successfully completed their Master's examination are awarded a Master of Science degree. The degree awarded is stated on the diploma.

Article 4.10 –Individual project

1. An individual project may replace an elective component.

2. For that purpose the student will prepare both a subject description including the aim and content of the project, as well as the intended deliverable for assessment. The student will seek a supervisor for the project amongst the staff of the Master programme (or staff of the related research institute).
3. A project may amount to a maximum of 12 EC.
4. Participation in a summer school may also be regarded as a project.
5. The prior approval of the Examinations Board is required for an individual project to be included in the student's study programme.

Article 4.11 – Double Master's programme
In order to be awarded two Master's degrees, the following requirements must be met:

1. The total programme of the candidate should amount to at least 180 EC.
2. The candidate's work for the programme (lectures, research work, etc.), must be of such a standard that all the compulsory requirements of each of the two programmes have been met.
3. The candidate must have conducted separate research work for both Master's degrees. This may consist of two separate Master theses with supervisors from the respective study programmes.
4. The Examinations Boards of both study programmes must approve the student's double Master's programme before the student commences the double Master's programme.

Chapter 5. Transitional and final provisions

Article 5.1 - Amendments and periodic review
1. Any amendment to the Teaching and Examination Regulations will be adopted by the dean after taking advice from the relevant Board of Studies. A copy of the advice will be sent to the authorised representative advisory body.
2. An amendment to the Teaching and Examination Regulations requires the approval of the authorised representative advisory body if it concerns components not related to the subject of Section 7.13, paragraph 2 sub a to g and v, and paragraph 4 of the WHW and the requirements for admission to the Master's programme.
3. An amendment to the Teaching and Examination Regulations is only permitted to concern an academic year already in progress if this does not demonstrably damage the interests of students.

Article 5.2 – Transitional provisions
Not applicable.

Article 5.3 - Publication
1. The Dean of the faculty will ensure the appropriate publication of these Regulations and any amendments to them.
2. The Teaching and Examination Regulations will be posted on the faculty website and deemed to be included in the course catalogue.

Article 5.4 – Effective date
These Regulations enter into force with effect from 1 September, 2014.
Adopted by the dean on 30 September 2014

Appendix 1 List of components provided by the study programme

Component	Code	Study load (EC)	Semester
Advanced Selforganisation (VU)	52848ADS6Y	6	1
Advanced Topics in Computational Finance (UvA)	5284COFA6Y	6	2
Algorithms in Sequence Analysis (VU)	5304AISA6Y	6	1
Bioinformatics for Translational Medicine (VU)	5304BFTM6Y	6	2
Bioinformatics I (UvA)	52841BIO6Y	6	1
Bioinformatics II (UvA)	52842BIO6Y	6	2
Biomolecular Simulations (UvA)	5254BISI6Y	6	2
Biosystems Data Analysis (UvA)	5304BIDA6Y	6	1
Bounded Rationality (UvA)	6414M0004Y	5	1
Complex System Simulation	5284COSS6Y	6	2
Computational Biology (UvA)	5284COBI6Y	6	2
Computational Finance (UvA)	5284COFI6Y	6	2
Concurrency and Multithreading (VU)	52848COM6Y	6	1
Data Mining Techniques (VU)	52848DAM6Y	6	2
Distributed Systems (VU)	52848DIS6Y	6	1
Evolutionary Computing (VU)	52848EVC6Y	6	1
Experimental Design and Data Analysis (VU)	52848EDD6Y	6	2
Fundamentals of Bioinformatics (VU)	53048FUB6Y	6	1
Graduation Research – Computational Science	5284GRI36Y	36	1&2
Heuristics (VU)	52848HEU6Y	6	1
Intelligent Web Applications (VU)	52848INW6Y	6	2
International Financial Economics (UvA)	6314M0195Y	5	2
Internet Programming (VU)	52848INP6Y	6	1
Introduction to Computational Science (UvA)	5284ITCS6Y	6	1
Large-Scale Computing Infrastructures (VU)	52848CLG6Y	6	2
Literature Study	5284LIST6Y	6	1
Machine Learning (VU)	52848MAL6Y	6	2
Neural Networks (VU)	52848NEN6Y	6	1
Non-linear Economic Dynamics (UvA)	6414M0012Y	5	1
Numerical Algorithms (UvA)	5284NUAL6Y	6	1
Performance of Networked Systems (VU)	52848PEN6Y	6	2
Scientific Computing (UvA)	5284SCCO6Y	6	2
Scientific Visualization and Virtual Reality(UvA)	5284SVVR6Y	6	1
Seminars Computational Science (UvA; runs over year 1 and 2)	5284SECS6Y	6	1
Statistical Theory of Complex Molecular Systems (UvA)	5254STTC6Y	6	1
Stochastic Calculus (UvA)	6414M0013Y	5	2
Stochastic Processes for Finance (VU)	53748SPF6Y	6	1
Stochastic Simulation (UvA)	5284STSI6Y	6	1
The Social Web (VU)	52948THS6Y	6	2
Understanding Molecular Simulation (UvA)	5254UNMS6Y	6	1

Appendix 2 Curriculum Master Computational Science 2014-2015

Curriculum Master Computational Science.

YEAR 1

Semester 1			Semester 2		
1.a block 1 September October	1.b block 2 November December	1.c block 3 January	2.a block 4 February March	2.b block 5 April May	2.c block 6 June
Seminars Computational Science (UvA)					
Numerical Algorithms (UvA)	Distributed Systems (VU)	Biosystems data analysis (UvA)	Scientific Computing (UvA)	Large Scale Computing and Infrastructures (VU)	Complex System Simulation (UvA)
Introduction Computational Science (UvA)	Stochastic Simulation (UvA)		Performance of Networks (VU)	Experimental Design and Data Analysis (VU)	
	Constrained Choice	Heuristics (VU)	Constrained Choice	Constrained Choice	

YEAR 2

Semester 1			Semester 2		
1.a block 1 September October	1.b block 2 November December	1.c block 3 January	2.a block 4 February March	2.b block 5 April May	2.c block 6 June
Seminars Computational Science (UvA)					
Concurrency and multi-threading (VU)	Literature Study	Graduation Research			
Elective	Elective				

Both Learning Lines
LL computing
LL modeling and simulation

Constrained Choice

Semester 1			Semester 2		
1.a block 1 September October	1.b block 2 November December	1.c block 3 January	2.a block 4 February March	2.b block 5 April May	2.c block 6 June
Neural Networks (VU)	Advanced Self Organisation (VU)		Machine Learning (VU)	Data Mining Techniques (VU)	
Evolutionary Computing (VU)	Scientific Visualisation & Virtual Reality (UvA)		Intelligent Web applications (VU)		
Internet Programming (VU)			The Social Web (VU)		

Electives

	Semester 1			Semester 2		
	1.a block 1 September October	1.b block 2 November December	1.c block 3 January	2.a block 4 February March	2.b block 5 April May	2.c block 6 June
Computational Finance / Economics (choice of electives to be discussed)	Stochastic Processes for Finance (VU)			Stochastic Calculus (UvA)		
	Non-linear Economic Dynamics (UvA)	Bounded Rationality (UvA)		Computational Finance (UvA)	Advanced topics in Computational Finance (UvA)	
				International Financial Economics		
Computational Biology (specific choice of electives to be discussed)	Fundamentals of Bioinformatics VU/UvA	Algorithms in Sequence Analysis (VU)		Computational Biology (UvA)	Bioinformatics II (UvA)	
	Bioinformatics I (UvA)				Bioinformatics for Translational Medicin (VU)	
Computational Chemisty (prerequisite ThermoDynamics)	Statistical Theory of Complex Molecular Systems (UvA)		Understanding Molecular Simulation	Biomolecular Simulations		
Earth Sciences	electives to be selected in collaboration with Prof. Bouten from UvA					
Scientific Computing, Numerical Math	electives to be selected in collaboration with Prof. Stevenson and Prof. Frank (UvA)					

Appendix 3 List of articles that must be included in the OER pursuant to the WHW (articles in framed boxes)

Section A	
Art. 1.1	7.13, para 1, WHW
Art. 2.1	7.13, para 2 sub w
Art. 3.2	7.13, para 2 sub e
Art. 4.2	7.13, para 2 sub h and l
Art. 4.3	7.13, para 2 sub n
Art. 4.4	7.13, para 2 sub o
Art. 4.5	7.13, para 2 sub j, h
Art. 4.7	7.13, para 2 sub r
Art. 4.8	7.13, para 2 sub k
Art. 4.9	7.13, para 2 sub p
Art. 4.10	7.13, para 2 sub q
Art. 4.11	7.13, para 2 sub a
Art. 5.1	7.13, para 2 sub u
Art. 5.2	7.13, para 2 sub m
Section B	
Art. 1.2	7.13, para 2 sub i
Art. 2.1	7.13, para 1 sub b, c
Art. 2.2	7.13, para 2 sub c
Art. 3.1	7.25, para 4
Art. 4.1	7.13, para 2 sub a
Art. 4.2	7.13, para 2 sub e, h, j, l
Art. 4.3	7.13, para 2 sub t
Art. 4.4	7.13, para 2 sub e, h, j, l
Art. 4.5	7.13, para 2 sub s
Art. 4.6	7.13, para 2 sub d
Art. 4.8	7.13, para 2 sub k

Appendix 4 Overview of guidelines pursuant to Section 9.5 WHW UvA

*The structure is a **format** established as a guideline:*		date of decision: 20 November 2012 entry into force: 1 September 2013
Section A		
Art. 4.5 para 3	*most recent result applies*	date of decision: 14 February 2008 entry into force: 14 March 2008
Art. 4.6	*Marks*	
	(5.5 as pass mark boundary)	date of decision: 14 February 2008 entry into force: 14 March 2008
	(5.1 to 5.9 not awarded as final marks)	date of decision: xxxx 2014 entry into force: 1 September 2014
Art. 4.13	*Fraud and plagiarism*	date of decision: 25 May 2010 entry into force: 1 September 2010
Section B		
Art. 3.1 para 6	*Entry requirements for Master's programme*	date of decision: 22 June 2006 entry into force: 22 June 2006 withdrawn on 1 September 2014