UNIVERSITY OF AMSTERDAM

VU VRIJE UNIVERSITEIT AMSTERDAM

FACULTY OF SCIENCE

TEACHING AND EXAMINATION REGULATIONS

PART B: programme-specific section

Academic year 2018 – 2019

MASTER'S PROGRAMME COMPUTATIONAL SCIENCE (JOINT DEGREE)
MASTER'S PROGRAMME COMPUTATIONAL SCIENCE (SINGLE DEGREE)

Chapter 1. General Provisions

Article 1.1 – Definitions
In addition to part A, the following definitions are used in part B
Personal Education Plan (PEP) 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 65015 (joint degree) and CROHO number 60299 (single degree), 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. A standard curriculum contains components offered by the Master's programme and the Master's Thesis. Students are required to have their personalised curriculum approved by the Examinations Board prior to graduation. Any subsequent changes in the student's personalized curriculum must again be approved by the Examinations Board. The ultimate requirement is that the approved personal curriculum should match the curriculum actually followed by the student.

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 is granted by the Admissions Board. All students holding an academic Bachelor degree in one of the Sciences or Engineering disciplines may apply for the master. Candidates for the programme should demonstrate sufficient knowledge in mathematics and computing skills and meet with the following requirements before they will be admitted to the programme: basic programming (any language), basic math knowledge in calculus and basic knowledge in probability theory and statistics.
Once accepted into the programme, an acceptance interview will be held with each student so as to identify strengths and weaknesses and help tailor the student's curriculum.

Article 3.2 – Pre-Master's programme

Students who do not hold an academic Bachelor's degree in one of the Sciences or Engineering disciplines can complete the Minor programme Computational Science.
The Minor programme Computational Science consists of 30 ECTS and acts as a formal pre-Master's programme for the Master's programme Computational Science. The Minor programme runs from September to January and consists of courses taught in the Dutch language. Therefore, students are required to understand the Dutch language.
The Minor Computational Science is intended for non-computing students and will train these students in mathematics and programming in preparation of the Master's programme. Students who are able to complete the Minor Programme successfully can apply for admission into the Master's programme.

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 EU/EEA/Swiss students and before 1 February in the case of non-EU/EEA/Swiss students.
2. Under exceptional circumstances, the Admissions 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:
    a. IELTS: 6,5, at least 6 on each sub-score (listening/reading/writing/speaking);
    b. TOEFL paper-based: 580;
    c. TOEFL Internet-based test: 92, at least 20 on each sub-score (listening/reading/writing/speaking);

    The foregoing examination must have been taken within two years before the student's enrolment.
    d. C1 Advanced: A or B;
    e. C2 Proficiency: minimal score of C

    Please note that the TOEFL-code for the Faculty of Science of the University of Amsterdam is 8628.
2. An exemption from the English examination referred to in the first paragraph shall be granted to students who:
    a. had previous education in secondary or tertiary education in one of the following English-speaking countries: Australia, Canada (English), New Zealand, Ireland, the United Kingdom or the United States of America;
    b. hold an English-language 'international baccalaureate' diploma;
    c. possessing a Bachelor's degree from a Dutch university satisfy the requirement of sufficient command of the English language;

d. passed the final examination for the subject of English as part of one of the following diplomas: VWO, Belgian ASO (Flemish).

Chapter 4. Curriculum structure

Article 4.1 – Composition of programme

1. The curriculum comprises the following:
   1. Compulsory components: 66 EC (24 EC on core courses in year 1 and 42 EC on the Master Thesis Computational Science of 42 EC in year 2);
   2. Constrained choice components: 30 EC;
   3. Elective components: 24 EC. 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. Every component will be tested. Within the Master's programme Computational Science different forms of testing are used. This is described per component in the course catalogue.
4. 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

Core Courses	
Year 1	**24 EC required**
All these components: Numerical Algorithms (UvA) Introduction to Computational Science (UvA)* * Students with sufficient prior knowledge can replace this component with an additional constrained choice component. Complex System Simulation (UvA) Seminars Computational Science	 6 6 6 6
Year 2	**42 EC required**
Master Thesis Computational Science (UvA)	42

Constrained Choice Courses	
As available/offered	**30 EC required**
Agent-based modelling Biosystems Data Analysis (UvA) Computational Biology (UvA) Computational Finance (UvA) Data Mining Techniques (VU) Evolutionary Computing (VU) Introduction to Systems Biology (VU) Large-scale Data Engineering (VU) Parallel Programming Practical (VU) Performance of Networked Systems (VU) Programming Large-scale Parallel Systems Scientific Computing (UvA) Stochastic Simulation	6 6 6 6 6 6 6 6 6 6 6 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
1. Elective courses can be chosen from the lists of recommended elective courses below. Please note that these lists are only examples of some of the possible electives. These are not exhaustive lists, and students are free to find other application domains and related courses, or find other courses in the already listed domains.
2. Course choices within an application domain should be made in consultation with the Programme Director or Thesis supervisor.

Recommended Elective Courses	**24 EC required**
Application domain Computational Science Core:	
- Behaviour Dynamics in Social Networks (VU)	6
- Experimental Design and Data Analysis (VU)	6
- Information Theory (UvA)	6
- Internet Programming (VU)	6
- Knowledge Representation on the Web (UvA)	6
- Machine Learning for the Quantified Self (VU)	6
- Scientific Visualisation & Virtual Reality (UvA)	6
- The Social Web (VU)	6
Application domain Computational Finance/Economics:	
- Advanced Topics in Computational Finance (UvA)	6
- Bounded Rationality (UvA)	5
- Non-linear Economic Dynamics (UvA)	5
- Quantitative Financial Risk Management (VU)	6
- Stochastic Calculus (UvA)	5
- Stochastic Processes for Finance (VU)	6
Application domain Computational Biology:	
- Algorithms in Sequence Analysis (VU)	6
- Bioinformatics I (UvA)	6
- Bioinformatics II (UvA)	6
- Bioinformatics for Translational Medicine (VU)	6
- Fundamentals of Bioinformatics (VU)	6
Application domain Computational Biomedicine:	
- Biomedical Modelling and Simulation (VU)	6
- From Genome to Physiome (UvA)	6
- Parameter Estimation Applied to Medical and Biological Sciences (VU)	6
- Physics of Organs 1: Cardio-Pulmonary Physics (UvA)	6
-	
Application domain Computational Chemistry:	
- Biomolecular Simulations (UvA)	6
- Statistical Theory of Complex Molecular Systems (UvA)	6
- Understanding Molecular Simulation (UvA)	6

Application domain High Performance Computing: - Concurrency and Multithreading (VU) - Distributed Systems (VU) - Large-Scale Computing and Infrastructures (VU)	 6 6 6
Application domain Computational Earth Sciences: *(course choices in consultation with the specialisation coordinator)*	
Application domain Scientific Computing, Numerical Math: *(course choices in consultation with the specialisation coordinator)*	

3. An elective component will only be seen as part of the programme if the Examinations Board has given its prior approval.
4. In terms of content, elective components must not show significant overlap with other components of the student's curriculum. The acceptable degree of overlap will be decided by the Examinations Board.
5. The Examinations Board may permit the choice of one or more components from other university-level Master Programmes. Approval must be obtained prior to enrolling on external courses.

Article 4.5 – Free curriculum

1. Subject to approval, and only in exceptional cases, 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 following conditions must at least be met in order for a student to be eligible for the master's degree:
    1. all compulsory components should be part of the student's programme;
    2. the level of the programme must match the objectives and exit qualifications that apply for the programme for which the student is enrolled.

Article 4.6 – Sequence of examinations

1. The student may start with the final project of the study programme (Master Thesis) only if all other compulsory components have been completed and the student has completed all necessary constrained choice courses (30 EC). The student's final study programme must also have been approved by the Examinations Board.
2. In case one or more courses are still to be completed, the programme director and thesis supervisor may agree that the student in question may start with the Graduation Research project.
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.

Article 4.7 – Participation in practical exercise and study group sessions

Not applicable.

Article 4.8 – Maximum exemption

1. A student may apply to the Examinations Board for the approval of transfer credits for components taken in a different programme, provided those components have not been used towards a degree at a different university. This is only possible for components at Master's level that are directly relevant to the Master Computational Science programme and only in case there is no overlap with

other components taken by the student. By default, all transfer credits are registered with a pass grade and will not be taken into account to compute the student's grade point average.
2. At most 36 EC of the student's programme can consist of such transfer credits.
3. For recognized double degree programmes e.g. ITMO this limit is determined by the agreement in question and may exceed the 36 EC.
4. Components successfully completed elsewhere during the programme may supplement the student's examination programme, subject to permission from the Examinations Board.

Article 4.9 – Validity period of examinations

1. The validity period of successfully completed (interim) examinations and granted exemptions can be limited as described in article 4.8 of part A (2018 – 2019). The results of successfully completed examinations/components are tested after 5 years on grounds of present-day scientific insights. If the acquired knowledge no longer corresponds to the present-day scientific insights and the objectives of the master programme the Examinations Board can decide that the result of a successfully completed examination has expired and therefore the validity period of the course in question has to be limited.
2. In addition to paragraph 4 of article 4.8 of part A (2018-2019) results of interim examinations which include theoretical course material are valid throughout the period of the course in question. Results of practical examinations are valid up to and including the end of the academic year in which they were achieved.

Article 4.10 – Marks

In addition to article 4.6 of part A in cases where the examination of a component consists of two or more parts, each of which are graded separately, raw grades are to be used when calculating the final grade (rounded grade).

Article 4.11 – 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 4.12 –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 has to find an examiner for the project as well as a daily supervisor).
3. A project may amount to a maximum of 12 EC.
4. The total of individual projects should not be more than 12 EC.
5. Participation in a summer school may also be regarded as a project. The amount of EC that can be credited depends upon the amount of teaching conducted during the school.
6. The prior approval of the Examinations Board is required for an individual project to be included in the student's study programme.

Article 4.13 – 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 within the programme (lectures, research work, etc.), must meet all of the compulsory requirements of the two programmes.
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. Academic student counselling

Article 5.1 Academic student counselling
The academic student counseling for this programme consists of:
study adviser and tutors

Chapter 6. Teaching evaluation

Article 6.1 Teaching evaluation
Teaching evaluation shall take place as follows:
- Course evaluations (of all courses of the master programme Computational Science);
- Curriculum evaluation of the degree programme
- Oral discussion.

All evaluation reports are discussed within the Programme Committee (OC). The OC advises the programme director on the quality of the degree programme

Chapter 7. Transitional and final provisions

Article 7.1 - Amendments and periodic review
1. Any amendment to the Teaching and Examination Regulations will be adopted by the dean after taking advice, and if necessary approval by 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 as stated in the WHW.
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 7.2 – Transitional provisions
If the curriculum changes, the new curriculum and regulations also apply to students already enrolled. Students can however request the Examinations Board to have the curriculum as it was when they started their studies apply to them. If the student is enrolled (over two or more years) during a change in the curriculum, concerning core courses or constrained courses, the student is allowed to choose constrained choice and core courses from any of the valid curricula.

Article 7.3 - 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 7.4 – Effective date
These Regulations enter into force with effect from 1 September, 2018.
Thus, drawn up by the Dean of the Faculty of Science on 28 August 2018.

Appendix 1 List of components of the study programme

Component	Code	Study load (EC)	Semester	Teaching method	Assessment
Advanced Topics in Computational Finance (UvA)	5284COFA6Y	6	2	IC	Written, oral
Agent-based Modelling (UvA)	5284AGBM6Y	6	1	L, PR	Witten
Algorithms in Sequence Analysis (VU)	5304AISA6Y	6	1	L, PR	Written
Behaviour Dynamics in Social Networks (VU)	52848BDI6Y	6	1	L, PR	Written
Bioinformatics for Translational Medicine (VU)	5304BFTM6Y	6	2	L, PR	Written, oral
Bioinformatics I (UvA)	52841BIO6Y	6	1	IC	Written, oral
Bioinformatics II (UvA)	52842BIO6Y	6	2	IC	Written, oral
Biomedical Modelling and Simulation (VU)	53548BIM6Y	6	1	L, PR	Written, oral
Biomolecular Simulations (UvA)	5254BISI6Y	6	2	L, CP	Written
Biosystems Data Analysis (UvA)	5304BIDA6Y	6	1	L, CP	Written
Bounded Rationality (UvA)	6414M0004Y	5	?	L, CP	Written, oral
Complex System Simulation (UvA)	5284COSS6Y	6	2	L, GP	Written, oral
Computational Biology (UvA)	5284COBI6Y	6	2	L, CP	Written
Computational Finance (UvA)	5204COFI6Y	6	2	L, CP	Written
Concurrency and Multithreading (VU)	52848COM6Y	6	1	L, PR	Written
Data Mining Techniques (VU)	52848DAM6Y	6	2	L, PR, GP	Written
Distributed Systems (VU)	52848DIS6Y	6	1	L, PR	Written
Evolutionary Computing (VU)	52848EVC6Y	6	1	L	Written
Experimental Design and Data Analysis (VU)	52848EDD6Y	6	2	L, CP	Written
From Genome to Physiome (UvA)	5354GETP6Y	6	2	PR	Written
Fundamentals of Bioinformatics (VU)	53048FUB6Y	6	1	L, CP	Written
Master Thesis Computational Science (UvA)	5284MTC42Y	42	1&2	IC	Written, oral
Information Theory (UvA)	5314INTH6Y	6	1	L, PR	Written
Internet Programming (VU)	52848INP6Y	6	1	L	Written
Introduction to Computational Science (UvA)	5284ITCS6Y	6	1	L, PR, CP	Written, oral
Introduction to Systems Biology (VU)	5304ITSB6Y	6	1	L, CP	Written
Knowledge Representation on the Web (UvA)	5204KROT6Y	6	2	L, PR	Written
Large-scale Data Engineering (VU)	52848LSD6Y	6	1	L, CP	Written, oral
Large-Scale Computing Infrastructures (VU)	52848LSC6Y	6	2	L, PR	Written, oral
Machine Learning for the Quantified Self (VU)	52848MLF6Y	6	2		
Non-linear Economic Dynamics (UvA)	6414M0012Y	5	?	L, PR, CP	Written
Numerical Algorithms (UvA)	5284NUAL6Y	6	1	L, CP	Written
Parallel Programming Practical (VU)	52848PPP6Y	6	1	PR	Written
Parameter Estimation Applied to Medical and Biological Sciences (VU)	53548PEM6Y	6	2	L	Written
Performance of Networked Systems (VU)	52848PEN6Y	6	2	L	Written
Physics of Organs 1: Cardio-Pulmonary Physics (UvA)	53541PHO6Y	6	1	PR, GP	Written, oral
Quantitative Financial Risk Management (VU)	52848QFR6Y	6	2	L	Written
Scientific Computing (UvA)	5284SCCO6Y	6	2	L, CP	Written
Scientific Visualization and Virtual Reality UvA)	5284SVVR6Y	6	1	L	Written, oral
Seminars Computational Science	5284SECS6Y	6	1+2	L, PR	
Statistical Theory of Complex Molecular Systems (UvA)	5254STTC6Y	6	1	L, PR	Written
Stochastic Calculus (UvA)	6414M0013Y	5		L, CP, GP	Written
Stochastic Processes for Finance (VU)	53748SPF6Y	6	1	L, PR	Written
Stochastic Simulation (UvA)	5284STSI6Y	6	1	L, CP	Written
The Social Web (VU)	52948THS6Y	6	2	L, PR	Written
Understanding Molecular Simulation (UvA)	5254UNMS6Y	6	1	L, CP	Written

L = Lectures, CP = Computer practical, PR = practical, IC = Individual coaching, GP = Group project