UNIVERSITY OF AMSTERDAM

VU VRIJE UNIVERSITEIT AMSTERDAM

FACULTY OF SCIENCE

TEACHING AND EXAMINATION REGULATIONS

PART B: programme-specific section

Academic year 2021 – 2022

MASTER'S PROGRAMME COMPUTATIONAL SCIENCE (JOINT DEGREE)

Contents

Chapter 1. General Provisions 2
Article B-1.1 – Definitions 2
Article B-1.2 – Study programme information 2
Article B-1.3 – Enrolment 2
Chapter 2. Programme objectives and exit qualifications 2
Article B-2.1 – Programme objectives 2
Article B-2.2 – Exit qualifications 2
Chapter 3. Further admission requirements 3
Article B-3.1 – Admission requirements 3
Article B-3.2 – Pre-Master's programme 3
Article B-3.3 – Limited programme capacity 3
Article B-3.4 – Final deadline for registration 3
Article B-3.5 – English language requirements 3
Chapter 4. Curriculum structure 4
Article B-4.1 – Composition of programme 4
Article B-4.2 – Compulsory components 4
Article B-4.3 – Practical exercise 5
Article B-4.4 – Free-choice elective components 5
Article B-4.5 – Free curriculum 6
Article B-4.6 – Sequence of examinations 6
Article B-4.7 – Participation in practical exercise and study group sessions 6
Article B-4.8 – Maximum exemption 6
Article B-4.9 – Validity period of examinations 7
Article B-4.10 – Marks 7
Article B-4.11 – Degree 7
Article B-4.12 –Individual project 7
Chapter 5. Academic student counselling 7
Article B-5.1 Academic student counselling 7
Chapter 6. Teaching evaluation 8
Article B-6.1 Teaching evaluation 8
Chapter 7. Transitional and final provisions 8
Article B-7.1 - Amendments and periodic review 8
Article B-7.2 – Transitional provisions 8
Article B-7.3 - Publication 8
Article B-7.4 – Effective date 8
Appendix 1: List of components of the study programme 9

Chapter 1. General Provisions

Article B-1.1 – Definitions

In addition to part A, the following definitions are used in part B

- (Personal) study plan an individual study plan for the student's Master programme.
- Master Thesis Project refers to the course (42EC) during which students work on the graduation project.
- Master Thesis refers to the report (document) students have to write during the course Master thesis project.

Article B-1.2 – Study programme information

1. The Master's programme Computational Science, CROHO number 65015 (joint degree), is offered on a full-time basis and the official language 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 https://www.uva.nl/en/about-the-uva/policy-and-regulations/rules-and-regulations/teaching/teaching.html
2. The programme consists of a two-year programme with a total study load of 120EC.
3. A standard curriculum contains components offered by the Master's programme and the Master Thesis Project. Students are required to have their personal study plan approved by the Examinations Board prior to graduation. Any subsequent changes in the student's personal study plan must again be approved by the Examinations Board. The ultimate requirement is that the approved personal study plan should match the curriculum actually followed by the student.

Article B-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 B-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 B-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 B-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. These requirements have to be demonstrated by grade transcripts including programming (minimum of 5EC) and at least 15EC (3 out of 4 courses) calculus (minimum of 5EC), linear algebra (minimum of 5EC), probability theory (minimum of 5EC) and statistics (minimum of 5 EC).

Article B-3.2 – Pre-Master's programme
1. The Admissions Board may decide that a holder of an academic bachelor's degree, who does not meet the admissions requirements, as stated in article B-3.1., will have to complete a premaster's programme of maximum 30 EC in order to have admission to the master's programme Computational Science.
2. 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 Computational Science is intended for non-computing students and will train these students in mathematics and programming in preparation of the Master's programme. 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.
3. Students who are able to complete the Minor Programme successfully will receive confirmation of admission to the Master's programme in the subsequent academic year.

Article B-3.3 – Limited programme capacity
Not applicable.

Article B-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 July 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 B-3.5 – English language requirements
1. The proficiency requirement in English as the official language can be met by the successful completion of one of the following examinations:
    a. IELTS: 7.0, and in addition at least 6.5 on each sub-score (listening/reading/writing/speaking);
    b. TOEFL Internet-based test: at least 100, at least 22 for listening, 24 for reading and writing and 25 for speaking.
    The TOEFL-code for the Faculty of Science of the University of Amsterdam is 9011;
    IELTS and TOEFL examinations must have been taken at most two years prior to the candidate's application for admission.
    Cambridge English Qualifications: C1 Advanced with a minimum score of 190 and C2 Proficiency (or CPE).

2. An exemption from the English examination referred to in the first paragraph shall be granted to students who:
    a. had previous education in 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. possessing a Bachelor's degree from a Dutch university satisfy the requirement of sufficient command of the English language;

Chapter 4. Curriculum structure

Article B-4.1 – Composition of programme

1. The curriculum comprises the following:
    1. Compulsory core components: 66 EC (24 EC on core courses in year 1 and 42 EC on the Master Thesis Project of 42 EC in year 2);
    2. Restricted-choice elective components: 30 EC;
    3. Free-choice elective components: 24 EC. Free-choice 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 B-4.2 – Compulsory components

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

Restricted-Choice Elective Courses	
As available/offered	**30 EC required**
Agent-based modelling (UvA)	6
Biosystems Data Analysis (UvA)	6
Computational Biology (UvA)	6
Computational Finance (UvA)	6
Data Mining Techniques (VU)	6
Distributed Algorithms (VU)	6
Evolutionary Computing (VU)	6
Experimental Design and Data Analysis (VU)	6
Large scale Data Engineering (VU)	6
Performance of Networked Systems (VU)	6
Programming Large-scale Parallel Systems (VU)	6
Scientific Computing (UvA)	6
Stochastic Simulation (UvA)	6

Article B-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 A-1.2 of part A.

Article B-4.4 – Free-choice elective components
1. Free-choice elective courses can be chosen from the lists of free-choice elective courses below. Please note that these lists are only examples of some of the possible free- choice 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 master thesis project supervisor.

Free-Choice Elective Courses	**24 EC required**
Application domain Computational Science Core:	
- Information Theory (UvA)	6
- Advanced Computer Networks (VU)	6
- Machine Learning 1 (UvA)	6
- Machine Learning for the Quantified Self (VU)	6
- The Social Web (VU)	6
Application domain Computational Finance/Economics:	
- Advanced Topics in Computational Finance (UvA)	6
- Complex Economic Dynamics (UvA)	5
- Stochastic Calculus (UvA)	5
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:	
- From Physics to Physiology (VU)	6
- Parameter Estimation Applied to Medical and Biological Sciences (VU)	6
Application domain Computational Chemistry and Physics:	
- Advanced Computational Condensed Matter (UvA)	6
- Biomolecular Simulations (UvA)	6
- Fundamental Topics in Statistical Physics 1 (UvA)	3
- Fundamental Topics in Statistical Physics 2 (UvA)	3
- Statistical Theory of Complex Molecular Systems (UvA)	6
- Understanding Molecular Simulation (UvA)	6
Application domain High Performance Computing:	
- Concurrency and Multithreading (VU)	6
- Distributed Systems (VU)	6
Application domain Computational Earth Sciences:	
(course choices in consultation with the specialisation coordinator)	
- Analysis and Modelling Lab (UvA)	6
- GIS/RS Science in Ecosystems Dynamics (UvA)	6
Application domain Scientific Computing, Numerical Math	
(course choices in consultation with the specialisation coordinator)	
- Numerical Linear Algebra (UvA)	6

- Numerical Methods for Stationary PDEs (UvA) - Scientific Computing (UvA) - Uncertainty Quantification and Data Assimilation (UvA)	6 6 6
Application domain Complex Systems - Agent-based modelling (UvA) - Complex System Simulation (UvA) - Information Theory (UvA) - Stochastic Simulation (UvA) - Theory of Complex Systems (UvA)	 6 6 6 6 6

3. A free-choice elective component will only be seen as part of a student's personal study plan if the Examinations Board has given its prior approval.
4. In terms of content, free-choice elective components must not show significant overlap with other components of the student's personal study plan. 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 B-4.5 – Free curriculum

1. Subject to approval, and only in exceptional cases, the student has the option of compiling a study plan 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 free curriculum must at least have the size, breadth and depth of a regular Master's programme and must match the exit qualifications that apply for the Master's programme Computational Science.

Article B-4.6 – Sequence of examinations

1. The student may start with the final project of the study programme (master thesis project) only if all other compulsory components have been completed and the student has completed all necessary restricted-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 course coordinator of the course Master Thesis Project and the supervisor of the thesis project in question may agree that the student in question may start with the master thesis project (by approving the project proposal submitted by the student in Datanose)
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 B-4.7 – Participation in practical exercise and study group sessions

Not applicable.

Article B-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 an

exemption 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 B-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 A-4.8 of part A (2021-2022). 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 A-4.8 of part A (2021-2022) 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 B-4.10 – Marks

1. The master thesis project is subject to a penalty system in order to encourage students to finish their project and master thesis within the standard expected time of 7 months (42 ECTS). Students are expected to finish their master thesis project within the time limit of 7 months plus a 2-month grace period (a total of 9 months). The final grade of a student who takes longer than these 9 months to finish his or her project will be subjected to a penalty. Any student who takes longer than 9 months receives a half-point deduction for every extra month taken, up to a maximum of 2 points (4 months). Students are allowed to formally ask for an extension of their master thesis project in case of special circumstances. These requests (and motivations) must be approved by the Examinations Board and the student in question must have discussed the reasons with the study advisor before asking for an extension.

Article B-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. If this is a joint degree, then this will be stated on the degree certificate

Article B-4.12 –Individual project

1. An individual project may replace a free-choice 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 6EC and thus replace one free-choice elective course.
4. The maximum of 6 EC mentioned in the previous paragraph applies only to individual projects started after September 1st 2021.
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.

Chapter 5. Academic student counselling

Article B-5.1 Academic student counselling

The academic student counselling for this programme consists of:
study adviser and tutors

Chapter 6. Teaching evaluation

Article B-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 B-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 Programme Committee. 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 demonstrably does not damage the interests of students.

Article B-7.2 – Transitional provisions
If the curriculum changes, the new curriculum and regulations also apply to students already enrolled. Students can however file a request to the Examinations Board in order 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 restricted-choice elective courses, the student is allowed to choose restricted-choice elective and core courses from any of the valid curricula.

Article B-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 B-7.4 – Effective date
Section B of these Regulations enter into force with effect from 1 September 2021 and applies up to and including 31 August 2022. If no new or amended TER B have been adopted by that date, the current TER B will be extended by a maximum of 6 months.

Thus, drawn up by the Dean of the Faculty of Science on 16 November 2021.

Appendix 1 List of components of the study programme

Component	Code	Study load (EC)	Semester	Teaching method	Assessment
Advanced Computational Condensed Matter (UvA)	5354ACCM3Y	3	2	L	Presentation
Advanced Computer Networks (VU)	52848INP6Y	6	1	L	Written
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
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
Biomolecular Simulations (UvA)	5254BISI6Y	6	2	L, CP	Written
Biosystems Data Analysis (UvA)	5304BIDA6Y	6	1	L, CP	Written
Complex Economic Dynamics (UvA)	6414M0322Y	5	1	L, CP	Written
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 Algorithms (VU)	52848DIA6Y	6	2	L, PR	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 Physics to Physiology (VU)	53548BIM6Y	6	1	L, PR, GP	Written, oral
Fundamental Topics in Statistical Physics 1 (UvA)	5354FTIS3Y	3	1	L, PR	Written
Fundamental Topics in Statistical Physics 2 (UvA)	5354FTIS3Y	3	2	L, PR	Written
Fundamentals of Bioinformatics (VU)	53048FUB6Y	6	1	L, CP	Written
Information Theory (UvA)	5314INTH6Y	6	1	L, PR	Written
Introduction to Computational Science (UvA)	5284ITCS6Y	6	1	L, PR, CP	Written, oral
Large-scale Data Engineering (VU)	52848LSD6Y	6	1	L, CP	Written, oral
Machine Learning 1 (UvA)	52041MAL6Y	6	1	L, CP, PR	Written
Machine Learning for the Quantified Self (VU)	52848MLF6Y	6	2	L, PR	Written
Master Thesis Project (UvA)	5284MTC42Y	42	1,2	IC	Written, defence
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	1	L	Written
Programming Large-scale Parallel Systems (VU)	52848PLS6Y	6	1	L	Written
Programming Multi-core and Many-core Systems (UvA)	5284PMCM6Y	6	2	L, CP	Written
Scientific Computing (UvA)	5284SCCO6Y	6	2	L, CP	Written
Scientific Visualization and Virtual Reality (UvA)	5284SVVR6Y	6	1	L	Written
Seminars Computational Science (UvA)	5284SECS6Y	6	1&2	L, PR	Written, oral
Statistical Theory of Complex Molecular Systems (UvA)	5254STTC6Y	6	1	L, PR	Written
Stochastic Calculus (UvA)	6414M0013Y	5		L, CP, GP	Written
Stochastic Simulation (UvA)	5284STSI6Y	6	1	L, CP	Written
The Social Web (VU)	52948THS6Y	6	1	L, PR	Written
Theory of Complex Systems (UvA)	5284THCS6Y	6	2	L, PR	Written
Uncertainty Quantification and Data Assimilation (UvA)	5334UQDA6Y	6	1	L	Written
Understanding Molecular Simulation (UvA)	5254UNMS6Y	6	1	L, CP	Written

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