

# **Appendix I Teaching outcomes of the degree programme (art. 1.3)**

## **The Master graduate in Computing Science**

- is fully acquainted with the basic terms and techniques used in Computing Science, and is familiar with a number of classical problems and their solutions;
- is experienced in the effective use of the tools available in solving Computing Science problems, such as compilers, theorem proofs, visualisation software, case-tools and domain specific software and hardware;
- is familiar with Computing Science applications in several other scientific fields of study;
- is capable of clear communication (both oral and in writing) on the subject of Computing Science and its applications;
- is capable of working in a team and in various projects;
- is sensitive to the social aspects of Computing Science applications and his/her own responsibilities therein;
- has specialized knowledge of theories, methods and techniques in one of the following subfields of Computing Science:
  - Intelligent Systems
  - Software Engineering and Distributed Systems
  - Computational Science and Visualisation
  - Management and Industry
- is able, by using scientific data and assessments, to analyse problems in Computing Science or a related scientific field of study, to provide specified solutions to the problem, and – if possible – to materialise these solutions (in the shape of an algorithm or program or an implementation in software or hardware);
- is able to critically read professional literature and to assess its correctness, usability and relevance;
- has a proper understanding of the scientific relevance of problem definitions and results, and of the validity of the scientific method used.

The first six learning outcomes are similar to those of the Bachelor programme in Computing Science. Some subfields in the Computing Science master degree have the following additional learning outcomes:

The Master in Computing Science graduated in the subfield of Intelligent Systems or Computational Science and Visualisation

- is able to contribute to the enhancement of scientific understanding in a subfield of Computing Science.

The Master in Computing Science graduated in the subfield of Software Engineering and Distributed Systems

- is capable of systematically designing and implementing software systems in cooperation with interested parties;
- is capable of integrating existing and new software components into a system that meets the quality criteria that were agreed upon.

The Master in Computing Science graduated in the subfield of Management and Industry (BBI)

- has a full understanding of the way in which businesses and policy organisations are functioning (governments and nongovernmental organisations, NGO's);
- understands the connections between natural science research, trade and industry and governmental policies;
- is able to integrate aspects of natural science, business and management;
- is able to translate a concrete problem definition in business or management into a natural science problem definition;
- is able to connect problem aspects of natural sciences to other relevant subject fields;
- is able to put research data and conclusions into a business or policy context;
- has developed his/her social and communicative skills;
- is able to write texts that are effective and to the point;

- is able to draw up an innovation plan or management plan for either a business or a government organisation;
- is able to give convincing oral presentation;
- is able to deliver an active contribution to plenary discussions;
- familiar with techniques used in business meetings and is capable of chairing a meeting;
- is able to work on a project as part of a team;
- is able to give and receive feedback concerning his/her way of functioning in a team;
- can work in a project;
- is able to fully consider the interests or objectives of the ordering customer;
- is able to plan a project independently;
- is able to cooperate with the relevant parties involved in the project;
- is able to adequately deal with limitations in time, information and means;
- is able to prepare the implementation of a project result;
- is capable of taking professional responsibility;
- is able to take responsibility on behalf of the organisation;
- is able to recognize the strategic aspects of his/her own project;
- is able to provide practical solutions in matters concerning the ethical and professional codes of his/her own field of expertise and of the professional organisation.

## **Appendix II Specializations of the degree programme (art. 2.2)**

The Master Computing Science has four specialisations:

- Intelligent Systems (IS)
- Computational Science and Visualisation (CSV)
- Software Engineering and Distributed Systems (SEDS)
- Science in Business & Public Policy (partly in Dutch only) (BBI)

## **Appendix III Content of the degree programme (art. 2.3)**

Below, the name of the module is followed by the load of study and the form of examination (p=practical, t=written exam).

The compulsory programme for **IS** is:

- Automated Reasoning (5 EC, pt);
- Web and Cloud Computing (5 EC, pt);
- Machine Learning (5 EC, pt);
- Student Colloquium (5 EC, p);
- Neural Networks (5 EC, pt);
- Pattern Recognition (5 EC, pt);
- Image Processing (5 EC, pt);
- Multi-Agent Systems (5 EC, p);
- Internship (15 EC, p);
- Computer Vision (5 EC, pt);
- Master Thesis (30 EC, p).

The compulsory programme for **CSV** is:

- Web and Cloud Computing (5 EC, pt);
- Scientific Visualisation (5 EC, pt);
- Introduction Computational Science (5 EC, p);
- Student Colloquium (5 EC, p);
- Advanced Computer Graphics (5 EC, p);
- Computer Vision (5 EC, pt);
- Image Processing (5 EC, pt);
- Geometric Algorithms (5 EC, pt);
- Internship (15 EC, p);
- Modeling and Simulation (5 EC, p);
- Master Thesis (30 EC, p).

The compulsory programme for **SEDS** is:

Web and Cloud Computing (5 EC, pt);  
Software Architecture (5 EC, p);  
Student Colloquium (5 EC, p);  
Software Patterns (5 EC, p);  
Ubiquitous Computing (5 EC, pt);  
Image Processing (5 EC, pt);  
Software Maintenance and Evolution (5 EC, p);  
Internship (15 EC, p);  
Advanced Software Architecture (5 EC, p);  
Distributed Systems (5 EC, pt);  
Master Thesis (30 EC, p).

The compulsory programme for **BBI** is:

First year compulsory courses (60 EC, pt) of only one of the three specialisations (**IS**, **CSV**, **SEDS**)

Introduction Science, Business and Policy (20 EC, p) (in Dutch only);

Final project (40 EC, p).

## **Appendix IV Optional modules (art. 2.4)**

Below, the name of the module is followed by the load of study and the form of examination (p=practical, t=written exam).

Optional modules in the programme for **IS** are:

15 EC are free choice

15 EC are chosen from:

Dynamic Logic (5 EC, p);

Natural Language Processing (10 EC, p);

Scientific Visualisation (5 EC, pt);

Handwriting Recognition (5 EC, p);

Cognitive modeling: basic principles and methods (5 EC, p);

Robotics (5 EC, p) (AI);

Robotics (5 EC, pt) (IEM);

Business Intelligence (5 EC, p);

Ubiquitous Computing (5 EC,pt);

Statistical Signal Processing (5 EC, pt);

Modelling and Simulation (5 EC, p);

Computational Semantics (5EC, p)

Formal Modeling of Concurrent and Communicating Systems (5 EC, pt)

Optional modules in the programme **CSV** are:

15 EC are free choice

15 EC are chosen from:

Numerical Mathematics I (5 EC, pt);

Numerical Mathematics II (5 EC, pt);

Problemsolving with Mathematica (5 EC, pt);

Pattern Recognition (5 EC, pt);

Machine Learning (5 EC, pt);

Neural Networks (5 EC, pt);

Computational Physics (5 EC, pt);

Cognitive modeling: basic principles and methods (5 EC, p);

Statistical Signal Processing (5 EC, pt);

Advanced self-organisation of social systems (5 EC,pt).

Optional modules in the programme **SEDS** are:

15 EC are free choice

15 EC are chosen from:

Scientific Visualisation (5 EC, pt);

Machine Learning (5 EC, pt);

Pattern Recognition (5 EC, pt);

Robotics (5 EC, pt) (IEM);

Sustainable and Integrated Information Systems (5 EC, p).

Business Intelligence (5 EC, p)

System Engineering (5 EC, p)

## **Appendix V Entry requirements and compulsory order of examinations (art. 3.2)**

No requirements for computing science courses.

The entry requirements of an Artificial Intelligence (AI), Industrial Engineering and Management (IEM), Mathematics (M), Arts (A) or Economics and Business (EB) course (optional modules) do not always apply to Computing Science students. If you do not meet the entry requirements for a particular AI, IEM, M, A or EB course, please contact the AI, IEM, M, A or EB study advisor or the course coordinator of the course you want to take to discuss the possibilities for your course entry.

## **Appendix VI Admission to the degree programme and different specializations (art. 4.1.1 + art. 4.2)**

The candidate is admitted to the programme with a bachelor degree in Computing Science. A candidate with a HBO bachelor is admitted in a specific specialisation after completing a matching bridging programme. All other candidates have to apply to the Admission Board.