

Appendix: Bachelor's degree programme in Computing Science 2016-2017

Appendix I – Learning outcomes of the degree programme (art. 1.3.a)

Holders of a Bachelor's degree in Computing Science:

1. Have the following knowledge, understanding and insights on an academic level:
 - a. knowledge of the main topics of Computing Science;
 - b. understanding of common themes and principles of Computing Science on different levels of abstraction;
 - c. insight in the applicability of Computing Science and the interplay between theory and practice;
 - d. either d1: in-depth knowledge of certain topics in the field of Computing Science, or d2: broad-based knowledge of topics in a different discipline.

2. Have the following skills and competences, on an academic level:
 - a. technical skills associated with Computing Science, including relevant mathematical and logical skills;
 - b. relevant soft skills, including communication, intercultural teamwork and self-managed learning;
 - c. academic skills, including conceptual thinking, critical questioning, judgement forming, scientific research, writing and presenting in English;
 - d. the competence to analyse, structure, redefine and solve problems, using computational methods and tools;
 - e. the competence to design, develop and evaluate computer systems;
 - f. the competence to apply their knowledge and understanding of Computing Science in a globalized professional and entrepreneurial context.

3. Have the following attitudes:
 - a. appreciation of the role and importance of mathematics, related disciplines and domain-specific knowledge;
 - b. commitment to professional responsibility, including ethical, societal and intercultural issues, with a self-critical attitude;
 - c. critical and academic attitude towards information and knowledge;
 - d. preparedness to life-long learning, based on the awareness of the highly dynamical character of Computing Science.

Appendix II – Majors and Minors in the degree programme (art. 2.1.4)

The degree programme has one Major: Computing Science.

**Appendix III – Course units in the propaedeutic phase, regular track
(art. 3.1.1, 3.2)**

Course unit name	ECTS	Type of examination	Practical
Imperative Programming	5	p,e	x
Introduction to Computing Science	5	p,e	x
Introduction to Logic (CS & MA)	5	p,e	x
Discrete Structures	5	p,e	
Computer Architecture	5	p,e	x
Calculus for Computing Science	5	p,e	x
Algorithms and Data Structures in C	5	p,e	x
Introduction to Scientific Computing	5	p,e	x
Program Correctness	5	p,e	
Artificial Intelligence 1	5	p,e	x
Object-Oriented Programming	5	p,e	x
Linear Algebra & Multivariable Calculus for AI&CS	5	p,e	
Total	60		

(p=practical and/or homework, e=examination, x=computer practical)

Appendix IV – Course units in the post-propaedeutic phase (art. 6.1.1, 6.2.1, 8.2)

Course unit	ECTS	Type of examination	Practical
Functional Programming	5	p,e	x
Advanced Object Oriented Programming	5	p	x
Statistics (AI and CS)	5	p,e	x
Software Analysis and Design	5	p	x
Introduction to Information Systems	5	p,e	x
Signals and Systems	5	p,e	x
Advanced Algorithms and Data Structures	5	p,e	x
Software Engineering I	5	p	x
Computing Science: Ethical and Professional Issues	5	p,e	x
Software Engineering II	5	p	x
Parallel Computing	5	p,e	x
Languages and Machines	5	p,e	
Minor (content determined by the student) <i>Optional course units offered by Computing Science that may be used to fill (part of) the minor:</i>	30		
- Requirements Engineering and Software Startups	5	p,e	x
- Information Security	5	p,e	x
- Introduction to Intelligent Systems	5	p,e	x
- Software Quality Assurance and Testing	5	p	x
- Compiler Construction	5	p,e	x
- Short programming project	5	p	x
NetComputing	5	p,e	x
Computer Graphics	5	p,e	x
Operating Systems	5	p,e	x
Bachelor's project	15	thesis and colloquium	variable
Total	120		

(p=practical and/or homework, e=examination, x=computer practical)

Compulsory order/Examination requirements

The examinations for the course units listed below may not be taken before the examinations for the associated course units have been passed:

- Signals and Systems after having passed Calculus for Computing Science and Linear Algebra & Multivariable Calculus for AI&CS.
- Bachelor's project after having gained the propaedeutic certificate and earned 60 ECTS from years 2 and 3.

Appendix V Entry requirements (Article 10.2.1)

A. HBO (university of applied science) propaedeutic certificate

1. The following requirements apply to the entrance examination as defined in Article 7.28.3 of the Act:

Degree programme	Subjects at VWO (pre-university) level	Requirement: Dutch as a Second Language (programme II) for non-native speakers of Dutch
B Biology	wia or wib + na+sk+bio	Yes
B Pharmacy	wia or wib + na+sk	Yes
B Life Science and Technology	wib+na+sk	Yes
B Computing Science	wib	
B Artificial Intelligence	wia or wib	
B Physics	wib+na	
B Chemistry	wib+na+sk	
B Astronomy	wib+na	
B Mathematics	wib	
B Chemical Engineering	wib+na+sk	
B Industrial Engineering and Management Science	wib	
B Applied Physics	wib+na	
B Applied Mathematics	wib	

wia = Mathematics A; wib = Mathematics B; na = Physics; sk = Chemistry; bio = Biology

2. Non-native speakers of Dutch who wish to be admitted to the Bachelor's degree programmes in Biology, Life Science and Technology, or Pharmacy must also have passed the State Examination in Dutch as a Second Language, Programme II (NT2-II).
3. The Faculty Committee for Special Admissions will determine whether deficiencies have been compensated satisfactorily.

B. Foreign qualifications (EEA)

1. Any certificate that grants access to a university in a European country will also grant access to Dutch universities.

2. The same requirements that also apply to candidates with an HBO (university of applied science) propaedeutic certificate will apply to these candidates in the entrance examination as defined in Article 7.28.3 of the Act (see A).
3. Non-native speakers of Dutch who wish to be admitted to the Bachelor's degree programmes in Biology, Life Science and Technology, or Pharmacy must also have passed the State Examination in Dutch as a Second Language, Programme II (NT2-II).
4. In addition, candidates are required to be competent in English: an IELTS score of 6.5, a TOEFL score of 580 (paper-based), of 237 (computer-based) or of 92 (internet-based) or equivalent.
5. The Faculty Committee for Special Admissions will determine whether deficiencies have been compensated satisfactorily.

C. Foreign qualifications (German)

1. German candidates must have a Zeugnis der Allgemeinen Hochschulreife ('Abitur').
2. The following requirements apply to the entrance examination as defined in Article 7.28.3 of the Act:

Degree programme	
B Biology	wi (LK or GK) na (LK or GK) sk (LK or GK) bio (LK or GK) (at least one subject at Leistungskurs level)
B Pharmacy B Life Science and Technology B Chemistry B Chemical Engineering	wi (LK or GK) na (LK or GK) sk (LK or GK) (at least one subject at Leistungskurs level)
B Computing Science B Mathematics B Applied Mathematics B Artificial Intelligence	wi (LK)
B Physics B Astronomy B Applied Physics	wi (LK) na (LK or GK)
B Industrial Engineering and Management Science	wi (LK or GK) na (LK or GK) (at least one subject at Leistungskurs level)

wi= Mathematics; na = Physics; sk = Chemistry; bio = Biology
LK = Leistungskurs level; GK = Grundkurs level followed until end of Class 13 or Class 12 (if Gymnasium education lasts 12 years).

3. Non-native speakers of Dutch who wish to be admitted to the Bachelor's degree programmes in Biology, Life Science and Technology, or Pharmacy must also have passed the State Examination in Dutch as a Second Language, Programme II (NT2-II).

- The Faculty Committee for Special Admissions will determine whether deficiencies have been compensated satisfactorily. **D. Foreign qualifications (International Baccalaureate)**

D. Foreign qualifications (International Baccalaureate)

- The following requirements apply to the entrance examination as defined in Article 7.28.3 of the Act:

Degree programme	from 2010/2011
B Biology	Biology (SL or HL) Maths (SL or HL) Physics (SL or HL) Chemistry (SL or HL) two of these subjects at HL
B Pharmacy B Life Science and Technology B Chemistry B Chemical Engineering	Maths (SL or HL) Physics (SL or HL) Chemistry (SL or HL) two of these subjects at HL
B Computing Science B Mathematics B Applied Mathematics	Maths HL
B Artificial Intelligence	Maths SL or Maths HL
B Physics B Astronomy B Applied Physics B Industrial Engineering and Management Science	Maths HL Physics HL

SL = Standard Level, HL = Higher Level

- Non-native speakers of Dutch who wish to be admitted to the Bachelor's degree programmes in Biology, Life Science and Technology, or Pharmacy must also have passed the State Examination in Dutch as a Second Language, Programme II (NT2-II).
- The Faculty Committee for Special Admissions will determine whether deficiencies have been compensated satisfactorily.

E. Foreign qualifications (non-EEA)

- A non-European certificate that according to NUFFIC and/or NARIC standards is equivalent to a Dutch VWO certificate will grant access to university in the Netherlands.
- The same requirements that also apply to candidates with an HBO (university of applied science) propaedeutic certificate will apply to these candidates in the entrance examination as defined in Article 7.28.3 of the Act (see A).
- Non-native speakers of Dutch who wish to be admitted to the Bachelor's degree programmes in Biology, Life Science and Technology, or Pharmacy must also have passed the State Examination in Dutch as a Second Language, Programme II (NT2-II).

4. In addition, candidates are required to be competent in English: an IELTS score of 6.5, a TOEFL score of 580 (paper-based), of 237 (computer-based) or of 92 (internet-based) or equivalent.
5. The Faculty Committee for Special Admissions will determine whether deficiencies have been compensated satisfactorily.

F. Entrance examination

1. The following requirements apply to the entrance examination as defined in Article 7.29 of the Act:

Degree programme	Nature and Health VWO level	or	Nature and Technology VWO level
B Biology	en, wia or b, sk, bio, na		en, wib, na, sk, bio
B Pharmacy	en, wia or b, sk, bio, na		en, wib, na, sk
B Life Science and Technology	en, wib, sk, bio, na		en, wib, na, sk
B Computing Science	en, wib, sk, bio		en, wib, na, sk
B Artificial Intelligence	en, wia of b, sk, bio		en, wib, na, sk
B Physics	en, wib, sk, bio, na		en, wib, na, sk
B Chemistry	en, wib, sk, bio, na		en, wib, na, sk
B Astronomy	en, wib, sk, bio, na		en, wib, na, sk
B Mathematics	en, wib, sk, bio		en, wib, na, sk
B Chemical Engineering	en, wib, sk, bio, na		en, wib, na, sk
B Industrial Engineering and Management Science	en, wib, sk, bio		en, wib, na, sk
B Applied Physics	en, wib, sk, bio, na		en, wib, na, sk
B Applied Mathematics	en, wib, sk, bio		en, wib, na, sk

en = English; wia = Mathematics A; wib = Mathematics B; na = Physics; sk = Chemistry; bio = Biology

2. Non-native speakers of Dutch who wish to be admitted to the Bachelor's degree programmes in Biology, Life Science and Technology, or Pharmacy must also have passed the State Examination in Dutch as a Second Language, Programme II (NT2-II).
1. The Faculty Committee for Special Admissions will determine whether deficiencies have been compensated satisfactorily.

Appendix VI Clustering of Bachelor's degree programmes

Article 4.3.4, Article 4.6.1

Degree programme CROHO code	Name of degree programme	Clustered with CROHO code	Name of degree programme
56286	B Life Science and Technology	56860 56157	B Biology B Pharmacy
56860	B Biology	56286 56157	B Life Science and Technology B Pharmacy
56157	B Pharmacy	56860 56286	B Biology B Life Science and Technology
56980	B Mathematics	56965	B Applied Mathematics
56965	B Applied Mathematics	56980	B Mathematics
50206	B Physics	56962 50205	B Applied Physics B Astronomy
56962	B Applied Physics	50206 50205	B Physics B Astronomy
50205	B Astronomy	56962 50206	B Applied Physics B Physics
56857	B Chemistry	56960	B Chemical Engineering
56960	B Chemical Engineering	56857	B Chemistry

Appendix VII Admission to the post-propaedeutic phase

Article 5.1.1

The following candidates will be admitted to the post-propaedeutic phase:

Holders of a propaedeutic certificate of the degree programme

Holders of a propaedeutic certificate of
the Bachelor's degree programme in Computing Science.

Appendix VIII Contact hours in the propaedeutic phase

Bachelor year 1	
<i>Type of contact</i>	<i>Number of contact hours per year</i>
Lectures	280
Tutorials	216
Practical	112
Study support/Mentor groups	–
Internship support and guidance	–
Exams	43
Misc. contact hours	–

Appendix IX University Minors of the faculty of Mathematics and Natural Sciences

Article 7.5.1

1. Neurosciences Minor:

- Neuroscience (15 ECTS)
- Behavioural Neuroscience (15 ECTS)

People, Planet, Profit Minor:

- Overview and Coherence People Planet Profit (10 ECTS)
- Paper People Planet Profit (5 ECTS)
- Project People, Planet, Profit (15 ECTS)

Astronomy through Space and Time Minor:

- The Evolving Universe (5 ECTS)
- Cosmic Origins (5 ECTS)
- Astrobiology (5 ECTS)

2. The Programme Committee for the Bachelor's degree programmes in Biology and Life Science & Technology also has authority in the field of the Neurosciences Minor and/or its course units.

The Programme Committee for the Master's degree programme in Energy & Environmental Sciences also has authority in the field of the People, Planet, Profit Minor and/or its course units.

The Programme Committee for the Bachelor's degree programme in Astronomy also has authority in the field of the Astronomy through Space and Time Minor and/or its course units.

3. The Board of Examiners for the Bachelor's degree programmes in Biology and Life Science & Technology and the Master's degree programmes in Biology, Ecology & Evolution, Marine Biology and Molecular Biology & Biotechnology also has authority in the field of the Neurosciences Minor and/or its course units.

The Board of Examiners for the Master's degree programme in Energy & Environmental Sciences also has authority in the field of the People, Planet, Profit Minor and/or its course units.

The Board of Examiners for the Bachelor's degree programme in Astronomy also has authority in the field of the Astronomy through Space and Time Minor and/or its course units.

4. These Teaching and Examination Regulations also apply in their entirety to the Minors in Neurosciences, People, Planet, Profit and Astronomy through Space and Time and/or their course units.