



## **Appendices for the Bachelor's degree programme(s) in Computing Science 2024-2025**

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## **Appendix 1. Learning outcomes of the Bachelor's degree programme (art. 3.1.1)**

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 of the Bachelor's degree programme (art. 3.7.4)**

The degree programme has one Major: Computing Science.



### Appendix III. Course units in the first year

- List of course units (art. 4.1.1)
- Compulsory order of examinations (art. 9.3)

Course unit name	Course code	ECTS
Programming Fundamentals	WBCS046-10	10
Introduction to Computing Science	WBCS005-05	5
Introduction to Logic (CS)	WBCS030-05	5
Discrete Structures	WBCS011-05	5
Computer Architecture	WBCS010-05	5
Calculus 1	WBCS055-05	5
Algorithms and Data Structures in C (for CS)	WBCS018-05	5
Introduction to Information Systems	WBCS021-05	5
Object-Oriented Programming (for CS)	WBCS028-05	5
Linear Algebra	WBCS048-05	5
Computer Networks	WBCS047-05	5
<b>Total</b>		<b>60</b>

### Appendix IV. Course units in the second and third year

- List of course units (art. 7.1.1)
- Compulsory order of examinations (art. 9.3)

Course unit name	Course code	ECTS
Advanced Algorithms	WBCS052-05	5
Advanced Programming	WBCS053-05	5
Calculus 2	WBCS054-05	5
Functional Programming	WBCS002-05	5
Web Engineering	WBCS008-05	5
Statistics and Probability	WBCS049-05	5
Introduction to Machine Learning	WBCS032-05	5
Software Engineering	WBCS017-10	10
Operating Systems	WBCS023-05	5
Languages and Machines	WBCS027-05	5
Introduction to Computer Graphics and Visualization	WBCS056-05	5
Minor (content determined by the student). Optional elective course units offered by Computing Science that may be used to fill (part of) the minor:		30
-Computational Complexity	WBCS044-05	5
-Information Retrieval	WBCS040-05	5
-Information Security	WBCS004-05	5
-Compiler Construction	WBCS039-05	5
-Programming in C++	WBCS034-05	5
- Short Programming Project	WBCS015-05	5
- Introduction to Image Processing	WBCS051-05	5
- Process-aware Information Systems	WBCS050-05	5
-Advanced Programming in C++	WBCS035-05	5
Research Skills in Computing Science	WBCS026-05	5



Computer Graphics	WBCS019-05	5
Bachelor's project	WBCS901-15	15
<b>Total</b>		<b>120</b>
C++ Fundamentals- <i>course not part of the CS curriculum but elective for other programmes- 5 ECTS</i>	WBCS033-05	-

As stated in Article 8.2.2, students are free to take any University Minor as a broadening module. The University minor Data Wise: Data Science in Society Minor organized by the Faculty of Behavioural and Social Sciences is not approved, **as the contents significantly overlap with the Computing Science BSc programme.**

It is also not possible to include a course from a University Minor if an equivalent or similar course is already taught in the Computing Science BSc programme.

Formal approval of the Board of Examiners is required, in case and before a student would like to deviate from these rules (e.g. including course units from other programmes and universities).

### - **Compulsory order of examinations; Article 9.3**

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 (WBCS042-05) after having passed Calculus for Computing Science (WBCS036-05) and Linear Algebra (WBCS048-05) *or* Linear Algebra & Multivariable Calculus (WBAI050-05).
- Calculus 2 (WBCS054-05) after having passed Calculus for Computing Science (WBCS036-05)
- Computer Graphics (WBCS019-05) after having passed Calculus for Computing Science (WBCS036-05) and Linear Algebra (WBCS048-05) *or* Linear Algebra & Multivariable Calculus (WBAI050-05).
- Introduction to Graphics and Visualization (WBCS056-05) after having passed Linear Algebra (WBCS048-05)
- Bachelor's project (WBCS901-15) after having completed the propaedeutic phase and earned 75 ECTS from years 2 and 3 of the Bachelor Computing Science. Additionally, students need to have submitted a study programme in Progress Portal. The entry requirements are checked after block 1b.
- C++ Fundamentals (WBCS033-05) after having passed Object-Oriented Programming for CS (WBCS028-05) and Imperative Programming (WBCS003-05) or equivalent.
- Programming in C++ (WBCS034-05) after having passed C++ Fundamentals (WBCS033-05) assignments. Alternatively, for Computing Science students: after having passed Advanced Object-Oriented Programming (WBCS001-05)
- Advanced Programming in C++ (WBCS035-05) after having passed Programming in C++ assignments.



## Appendix V. Contact hours (art. 3.6)

Degree programme	
Structure contact hours	Contact hours per year
Lectures	280
Tutorials	216
Practical	112
Study support/Mentor groups	–
Internship support and guidance	–
Exams	43

## Appendix VI. Additional Requirements Open degree Programmes (art. 7.3)

In exceptional circumstances students wishing to pursue an open degree programme may file a request with the Board of Examiners. The Board of Examiners will evaluate whether the proposed curriculum meets the learning outcomes of the degree programme and can determine further conditions in their Rules and Regulations.



## Appendix VII. Transitional provisions (art. 12.1)

Discontinued courses for students who started in 2022-2023 and earlier

Discontinued course	Course code	Replacement course	Course code
Imperative Programming (for CS)	WBCS003-05	Imperative Programming (for AI)	WBAI003-05
Program Correctness	WBCS024-05	Compiler Construction <i>or</i> Computational Complexity	WBCS039-05 <i>or</i> WBCS044-05
Imperative Programming for CS AND Program Correctness	WBCS003-05 AND WBCS024-05	Programming Fundamentals	WBCS046-10
Statistics	WBAI049-05	Statistics and Probability	WBCS049-05

For students who started 2022-2023 and earlier Linear Algebra & Multivariable Calculus (WBAI050-05) is compulsory, for students that started from 2023-2024 Linear Algebra (WBCS048-05) is compulsory. Students that have already successfully finished Linear Algebra & Multivariable Calculus (WBAI050-05) are not allowed to take Linear Algebra (WBCS048-05).

Program Correctness can be replaced by either Compiler Construction (WBCS039-05) or Computational Complexity (WBCS044-05) (i.e. one elective course becomes a compulsory course).

Students that have not successfully finished both Imperative Programming for CS (WBCS003-05) and Program Correctness (WBCS024-05) can take Programming Fundamentals (WBCS046-10) as a replacement course.

For students who started in 2022-2023 and later Statistics and Probability (WBCS049-05) is compulsory. For students who started in 2021-2022 and earlier Statistics (WBAI049-05) is compulsory. Students that have successfully finished Statistics (WBAI049-05) cannot take Statistics and Probability (WBCS049-05).

Students that have already successfully finished Network Centric Systems (WBCS031-05) are not allowed to take Computer Networks (WBCS047-05).

Signals & Systems for CS (WBCS042-05) will not be offered in 2024-2025. For those students that have taken, but not successfully passed the course, there will be an exam and resit exam offered in 2024-2025. The course itself will be offered again in 2025-2026.

Students that started in or before 22-23 who were not able to take Signals & Systems CS in 23-24 due to not meeting the entry requirements or who did not complete the course are permitted to take either Introduction to Computer Graphics and Visualization (WBCS056-05), Introduction to Image Processing (WBCS051-05) or Process-aware Information Systems (WBCS050-05) as a replacement course.

Fundamentals of Distributed Systems (WBCS057-05) will not be offered in 2024-2025. For those students that have taken, but not successfully finished the course, there will be an exam and resit exam offered in 2024-2025. The course itself will be offered again in 2025-2026.



**Discontinued courses as of 2024-2025**

Discontinued course	Course code	Replacement course	Course code
Problem Analysis and Software Design	WBCS012-05	Short Programming Project	WBCS015-05
Introduction to Scientific Computing	WBCS022-05	Introduction to Machine Learning	WBCS032-05
Computing Science: Ethical and Professional Issues	WBCS020-05	n/a	

The learning outcomes of Computing Science: Ethical and Professional Issues (WBCS020-05) will be covered in Research Skills in CS (WBCS026-05).

For students who have taken but have not successfully finished the above discontinued courses, there will be an exam and resit exam offered in 2024-2025.

**New mandatory courses**

For students who started in 23-24 Introduction to Machine Learning (WBCS032-05) is mandatory (was: elective).

For students who started in 23-24 Calculus 2 (WBCS054-05) is mandatory.

For students who started in 23-24 Introduction to Computer Graphics and Visualization (WBCS056-05) is mandatory.

**From 2024-2025 onwards**

Course name	May be replaced with
Calculus for CS	Calculus 1
Advanced Object-Oriented Programming	Advanced Programming
Advanced Algorithms and Data Structures	Advanced Algorithms

Students who have passed Calculus for CS may not take Calculus 1

Students who have passed Advanced-Object Oriented Programming may not take Advanced Programming

Students who have passed Advanced Algorithms and Data Structures may not take Advanced Algorithms