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Appendices for the Bachelor's degree programme(s) in Computing Science 2025-2026

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Appendix I. Learning outcomes of the Bachelor's degree programme (art. 3.1)

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.

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Appendix II. Majors and Minors of the Bachelor's degree programme (art. 3.7 and 7.1.3)

The degree programme has the following Major:

Computing Science

The degree programme has the following Minor(s):

The degree programme includes a 30 ECTS free minor space, see also TER article 7.1.
Students can fill in their Minor slot with the following components:

a. University minor : 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.

b. a study period at another university (national or abroad): formal approval of the Board of Examiners is required.

c. a Teacher Training Minor (see also TER article 8.6)

d. a broadening and/or deepening Minor, comprising of course units from outside their own major. Students can choose Computing Science elective courses.

e. an internship worth a maximum of 15 ECTS as part of the 30 ECTS free minor space [WBCS062-05 or WBCS062-15]. This can be an in-company internship or a research internship.

f. personal minor: A study programme compiled by the student, representing 30 ECTS, and consisting of course units at the UG or elsewhere. Formal approval of the Board of Examiners is required.

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).

Appendix III. Course units in the first year of the degree programme

- **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
Total		**60**

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Appendix IV. Course units in the second and third year of the degree programme

- **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**
Introduction to Deep Neural Networks	*WBCS059-05*	*5*
Computational Complexity	*WBCS044-05*	*5*
Information Retrieval	*WBCS040-05*	*5*
Computer Graphics	*WBCS019-05*	*5*
Compiler Construction	*WBCS039-05*	*5*
Programming in C++	*WBCS034-05*	*5*
Signals and Systems for CS	*WBCS042-05*	*5*
Introduction to Image Processing	*WBCS051-05*	*5*
Process-aware Information Systems	*WBCS050-05*	*5*
Introduction to Augmented Reality	*WBCS060-05*	*5*
Basic Approaches to the Semantics of Computation	*WBCS061-05*	*5*
*Bachelor Internship**	*WBCS062-05*	*5*
*Bachelor Internship**	*WBCS062-15*	*15*
Advanced Programming in C++	*WBCS035-05*	*5*
Research Skills in Computing Science	WBCS026-05	5
Information Security	WBCS004-05	5
Fundamentals of Distributed Systems	WBCS057-05	5
Bachelor's project	WBCS901-15	15
Total		**120**
C++ Fundamentals- *course not part of the CS curriculum but elective for other programmes- 5 ECTS*	*WBCS033-05*	**-**

*Students can take one option of the Bachelor Internship; the 15 ECTS or the 5 ECTS course in either block 1a or block 1b.

Compulsory order of examinations (art. 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:

Course unit name and code	Entry requirements
Introduction to Deep Neural Networks [WBCS059-05]	Introduction to Machine Learning [WBCS032-05] or equivalent
Bachelor Internship [WBCS062-05]	Software Engineering [WBCS017-10]
Bachelor Internship [WBCS062-15]	Software Engineering [WBCS017-10]
Computer Graphics [WBCS019-05]	Calculus for Computing Science [WBCS036-05] *or* Calculus 1 [WBCS055-05] Linear Algebra [WBCS048-05] *or* Linear Algebra & Multivariable Calculus [WBAI050-05]
Signals and Systems for CS [WBCS042-05]	Calculus for Computing Science [WBCS036-05] *or* Calculus 1 [WBCS055-05] Linear Algebra [WBCS048-05] *or* Linear Algebra & Multivariable Calculus [WBAI050-05]
Basic Approaches to the Semantics of Computation [WBCS061-05]	Languages and Machines [WBCS027-05] or equivalent
Bachelor's project [WBCS901-15]	Completion of all first- year course units Completion of at least 75 ECTS from years 2 and 3 of the Bachelor Computing Science Submission of study programme in Progress Portal The entry requirements are checked after block 1b
C++ Fundamentals [WBCS033-05]	Object-Oriented Programming for CS [WBCS028-05] and Imperative Programming [WBCS003-05] or equivalent
Programming in C++ [WBCS034-05]	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]	Programming in C++ [WBCS034-05] 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)

Students who have already completed a discontinued course are excluded from taking the respective replacement course. Any cases not listed in the Teaching and Examination Regulations, through either the current curriculum or the transitional provisions, are to be treated by the Board of Examiners of the degree programme.

Changes from 2025-2026 onwards

For students who started in 22-23 and earlier, Computer Graphics [WBCS019-05] or Introduction to Computer Graphics and Visualisation [WBCS056-05] is mandatory.

For students who started in 22-23 and earlier, Information Security [WBCS004-05] is an elective course.

From 2025-2026 Short Programming Project [WBCS015-05] is discontinued, students that have successfully completed the course can still use it as an elective course unit but cannot also take the Bachelor Internship [WBCS062-05] or [WBCS062-15].

Discontinued courses as of 2024-2025

Discontinued course	Course code	Replacement course	Course code
Problem Analysis and Software Design	WBCS012-05	Short Programming Project or Bachelor Internship	WBCS015-05 or WBCS062-05
Introduction to Scientific Computing	WBCS022-05	Introduction to Machine Learning	WBCS032-05
Computing Science: Ethical and Professional Issues	WBCS020-05	n/a	
Software Language Engineering	WBCS016-05	n/a	

The learning outcomes of Computing Science: Ethical and Professional Issues [WBCS020-05] will be covered in Software Engineering [WBCS017-10], Introduction to Computing Science [WBCS005-05] and Research Skills in Computing Science [WBCS026-05].
For students who started in 2022-2023 or earlier Computing Science: Ethical and Professional Issues [WBCS020-05] is mandatory.

Software Language Engineering [WBCS016-05] will become a Master course [WMCS037-05] from 2024-2025. Students that have already successfully finished Software Language Engineering in their Bachelor are not allowed to take the course as part of their Master programme.

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 - changed courses
The following courses will continue under a new course name. Due to the overlap in content between the courses, students are not allowed to take both courses.

Course name	**Course code**	**Will be replaced with**	**Course code**
Calculus for CS	WBCS036-05	Calculus 1	WBCS055-05
Advanced Object-Oriented Programming	WBCS001-05	Advanced Programming	WBCS053-05
Advanced Algorithms and Data Structures	WBCS009-05	Advanced Algorithms	WBCS052-05

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 *or* Computational Complexity	WBCS039-05 *or* 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 mandatory, for students that started from 2023-2024 Linear Algebra [WBCS048-05] is mandatory. 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 mandatory. For students who started in 2021-2022 and earlier Statistics [WBAI049-05] is mandatory. 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].

For students who started in 23-24 and later, Signals and Systems CS [WBCS042-05] is an elective course. For students that started in or before 22-23, Signals and Systems CS [WBCS042-05] is mandatory.