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To participate in the Bachelor Research Project the student must have:
(1) successfully completed the first year of the degree programme.
(2) achieved a minimum of 130 ECTS in the curriculum after period 1b.
(If the Project is done in period 1a the student should have achieved 130 ECTS in the curriculum after period 2a of the previou
(3) applied for their diploma (by sending a study programme for approval to the Board of Examiners) one month before the st
(4) apply to the course coordinator before starting in 2b or the study advisor before starting outside of block 2b.

Appendix for the Bachelor's degree programme in Chemistry

I. Learning outcomes of the Bachelor's degree programme
II. Majors and Minors
III. Course units first year of the degree programme
IV. Course units second and third years of the degree programme
V. Contact hours
VI. Additional Requirements Open degree Programmes
VII. Transitional provisions

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

A. Generic learning outcomes – Knowledge

A1. Bachelor's graduates have general knowledge of the foundations and history of mathematics, natural sciences and technology, in particular those of their own discipline.
A2. Bachelor's graduates have mastered the basic concepts of their own discipline (see Appendix 1 for further specification) to a certain extent and are familiar with the interrelationships of these concepts within their own discipline as well as with other disciplines.
A3. Bachelor's graduates have in-depth knowledge of several current topics within their own discipline.
A4. Bachelor's graduates are familiar with the quantitative character of the fields of mathematics and natural sciences and have an understanding of the methods used in these fields, and particularly within their own discipline, including computer-aided methods.
A5. Bachelor's graduates have sufficient knowledge and understanding of mathematics and natural sciences to successfully complete a follow-up Master's degree programme in their own discipline.
A6. Bachelor's graduates are aware of the societal, ethical and social aspects involved in the fields of mathematics and natural sciences.

B. Generic learning outcomes – Skills

B1. (Research) Bachelor's graduates are able to draw up a research question, design, plan and conduct research and report on it independently with a certain degree of supervision. Bachelor's graduates are able to evaluate the value and limitations of their research and assess its applicability outside their own field.
B2. (Designing) Bachelor's graduates are able to translate a problem, in particular a design problem, into a plan of approach and – taking into account the requirements of the client and/or technical preconditions – find a solution.
B3. (Gathering information) Bachelor's graduates are able to gather relevant information using modern means of communication and to critically interpret this information.
B4. (Collaborating) Bachelor's graduates are able to collaborate in teams (including multidisciplinary teams) on technical-scientific problems.
B5. (Communicating) Bachelor's graduates are able to communicate orally and in writing in academic and professional contexts, with both colleagues and others. They are familiar with the relevant means of communication.
B6. (Reflecting) Bachelor's graduates are able to assess their own actions and those of others in a natural sciences context, bearing in mind the social/societal and ethical aspects.
B7. (Learning skills) Bachelor's graduates are able to apply learning skills that enable them to pursue a follow-up degree and acquire knowledge in new fields with a high level of autonomy.
B8. Additional subject-specific skills are listed in D.

C. Degree programme-specific learning outcomes – Basic Knowledge

The Bachelor's graduate in Chemistry has:
C1. knowledge of the most important fields of Chemistry: Inorganic, Organic, Analytical, Physical, Theoretical Chemistry, and Biochemistry, furthermore general knowledge of more specific field such as Macromolecular Chemistry, Materials Chemistry, etc.,
C2. knowledge of at least one multidisciplinary field: 'Chemistry of Life', 'Smart Materials' and 'Sustainable Energy and Chemistry',
C3. a broad general knowledge of subjects within their own discipline or of subjects within a different discipline,
C4. necessary background knowledge of Mathematics and Physics,
C5. understanding of the position and role of the discipline within science and society, and also in the international character of the discipline.

The Bachelor's graduate has become familiar with the following key elements of Chemistry:
C6. The important aspects of chemical terminology, nomenclature and conventions.
C7. Numerical and computational skills, including error analysis, understanding of the proper order of magnitude and correct use of units.
C8. The most important types of chemical reactions and their characteristics.
C9. The principles and procedures that are used in the chemical analysis and in the characterization of chemical compounds.
C10. The fundamental techniques of structural analysis, including spectroscopy.
C11. The properties of various states of matter and the common theories to describe them.
C12. The principles of Quantum Mechanics and its applications in the description of structure and properties of atoms and molecules.
C13. The principles of Thermodynamics and its applications in Chemistry.
C14. The kinetics of chemical processes, catalysis and mechanical interpretation of chemical reactions.
C15. The typical properties of elements and their compounds, including group relationships and trends in the periodic table.
C16. The structural properties of chemical elements and their compounds.
C17. The typical properties of aliphatic, aromatic, heterocyclic and organometallic compounds.
C18. The nature and behavior of functional groups in molecules.
C19. Important synthetic routes of organic/inorganic chemistry.
C20. The relationship between bulk properties of matter and properties of individual atoms and molecules, including macromolecules.
C21. The structure and reactivity of important types of biomolecules and the chemistry of important biochemical processes.
C22. The design of processes (also on industrial scale), taking into account flow and transfer of matter and energy.
C23. Properties of chemicals and the involved environmental and safety aspects.

D. Degree programme-specific learning outcomes - Skills
The Bachelor's graduate in Chemistry has developed the skills and competencies mentioned below.

Chemistry-related cognitive skills and competencies
The Bachelor's graduate is:
D1. able to demonstrate and use their knowledge and understanding of essential facts, concepts, principles and theories related to the topics, as defined in A, in various situations,
D2. able to apply knowledge and understanding to solve basic qualitative and quantitative problems,
D3. skilled in evaluating, interpreting and combining chemical information and data,
D4. able to recognize and implement 'good laboratory practice',
D5. familiar with project work,
D6. able to adopt a professional attitude regarding environmental and safety aspects and possible ethical implications in the context of research, education and industry.

Chemistry-related practical skills
The Bachelor's graduate is:
D7. skilled in the use of standard laboratory procedures and in the use of equipment for synthetic and analytical work,
D8. able to verify chemical properties, to observe and measure events or changes, and to systematically archive and document data,
D9. able to interpret data, obtained from observations and measurements, and relate it to the right theories,
D10. able to assess the risks of laboratory procedures and the use of chemicals,
D11. skilled in the safe handling of chemicals, taking into account physical and chemical properties, including the various specific risks of use, and is also able to act adequately in emergency situations in the laboratory,
D12. able to use IT skills appropriate to the chosen specialization.

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(s);

The elective part within the Major is chosen from the following three specializations:
a) Chemistry of Life
b) Smart Materials
c) Sustainable Chemistry and Energy

The degree programme has the following Minor(s):

The Minor may either be the Minor Chemistry 'Science for Scientists', Minor Industrial Chemistry or may be chosen from the collection of university Minors (FSE BSc TER, Article 8.5).

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)**

Practicals are defined as laboratory practicals

Course unit name	Code	ECTS	Practical	Entry requirements
Maths for Chemistry and Engineering	WBCH048-05	5		
Molecules: Structure, Reactivity, and Function	WBCH004-05	5	x	
Concepts of Chemistry	WBCH063-05	5	x	
Transport Phenomena	WBCE023-05	5		
Organic Chemistry 1	WBCH013-05	5		
Practical Synthesis and Analysis 1	WBCH016-05	5	x	Molecules: Structure, Reactivity, and Function and Organic chemistry 1
Biochemistry	WBCH064-05	5		
Biochemistry practical and programming	WBCH065-05	5	x	
Physical Chemistry	WBCH066-05	5		
Inorganic Chemistry	WBCH039-05	5		
Spectroscopy	WBCH044-05	5		
Linear Algebra & Multivariable Calculus for Chemistry	WBCH011-05	5		

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

- **Admission to the second year**
- **List of course units (art. 7.1.1)**
- **Compulsory order of examinations (art. 9.3)**

The following candidates will be admitted to the second year:

- Students who have been issued a positive study advice from the degree programme in question
- Students who have been issued a positive study advice from one of the following degree programmes: - BSc Chemical Engineering.

Course unit name	Code	ECTS	Practical	Entry requirements
Physical Properties of Materials 1	WBCH006-05	5		
Organic Chemistry 2	WBCH005-05	5		Organic Chemistry 1 or Organic Chemistry for Life Science 1
Synthesis Lab Course 2	WBCH008-05	5	x	Practical Course: Synthesis and Analysis or Practical Skills in Organic Chemistry (for LST) (WBLT019-05)
Physical Chemistry 2	WBCH015-05	5		
Bioenergy, Metabolism and Bioresources	WBCH009-05	5		
Soft Molecular Materials	WBCH017-05	5		
Quantum chemistry	WBCH029-05	5		
Chemistry & Society: Ethical and Professional Aspects	WBCH045-05	5		
Toxicology and chemical safety	WBCH068-05	5		
(Bio)Synthesis and Analysis 3	WBCH071-05	5	x	Biochemistry practical and programming (WBCH065-05)
Specialization: ● Smart Materials ● Sustainable Chemistry and Energy ● Chemistry of Life		20		See individual table
Research Practical	WBCH070-05	5	x	Practical Course: Synthesis and Analysis, or Practical Skills in Organic Chemistry (for LST) (WBLT019-05) and (Bio)Synthesis and Analysis 3
Bachelor's Research Project	WBCH901-15	15	x	
Minor		30		Students must have successfully completed the first year of the degree programme to be admitted to the Minor. (BSc TER Article 6.1.4)

Chemistry of Life

Course unit name	Code	ECTS	Practical	Entry requirements

Recombinant DNA and Biotechnology	WBCH042-05	5		
Chemical Biology	WBCH036-05	5		Organic Chemistry 1 and 2 or Organic Chemistry for Life Science 2 (WBLT018-05)
(Bio)-catalysis	WBCH019-05	5		
Cellular Chemistry	WBCH021-05	5		

Smart Materials

Course unit name	Code	ECTS	Practical	Entry requirements
Physical Properties of Materials 2	WBCH041-05	5		
Molecular Design	WBCH040-05	5		
Materials Design: Theoretical Methods	WBCH024-05	5		
Trends in Polymer Science	WBCH034-05	5		

Sustainable Chemistry and Energy

Course unit name	Code	ECTS	Practical	Entry requirements
Chemical Analysis	WBCH069-05	5	x	
Physical Organic and Photo-chemistry	WBCH027-05	5		
(Bio)-catalysis	WBCH019-05	5		
Green Chemistry and Photochemistry	WBCH050-05	5		

Minor Chemistry 'Science for Scientists'

The Minor comprises 30 ECTS and is a coherent and deepening package of course units chosen from the following list. The option to carry out a research project is not available.

Course unit name	Code	ECTS	Practical	Entry requirements
Electrochemical Technology	WBCE021-05	5	x	
Artificial Intelligence and Machine Learning in Chemistry	WBCH060-05	5		
Nuclear Energy	WBPH010-05	5		
Nuclear and Radiochemistry	WBCH052-05	5		
Single-Phase Reactors	WBCE006-05	5		
Organic synthesis	WBCH051-05	5		
Carbohydrates	WBCH010-05	5		
Molecular Biophysics	WBPH023-05	5		
Coordination chemistry: from molecules to materials	WBCH062-05	5		Inorganic chemistry
Introduction to Science Education (EC)	WBEC002-05	5		
Introduction to Science Communication (EC)	WBEC001-05			
Solar Cells	WBCH018-05	5		
Polymer Engineering	WBCE030-05	5		
Biochemical Engineering	WBCE029-05	5	x	
Research trends in sustainable chemical engineering	WBCE031-05	5		
Macromolecular Chemistry	WBCH023-05	5		

Minor Industrial Chemistry

The Minor comprises 30 ECTS and is a coherent and deepening package of course units chosen from the following list. The option to carry out a research project is not available.

Course unit name	Code	ECTS	Practical	Entry requirements
Electrochemical Technology	WBCE021-05	5	x	
Single-Phase Reactors	WBCE006-05	5		
Polymer Engineering	WBCE030-05	5		
Research trends in sustainable chemical engineering	WBCE031-05	5		
Numerical Analysis for Chemical Engineers	WBCE032-05	5		
Chemical Process Development and Design	WBCE007-05	5		
Process Control & Dynamics	WBCE007-05	5		
Special Process Equipment	WBCE012-05	5		General Process Equipment

Appendix V. Contact hours (art. 3.6)

Degree programme year 1	
Structure contact hours	**Contact hours per year**
Lectures	300
Tutorial / Practicals	290 / 295
Tutoring	8
Supervision during an internship	-
Examinations / Assignments	24 / 24

Degree programme year 2	
Structure contact hours	**Contact hours per year**
Lectures	260
Tutorial / Practicals	160 / 200
Tutoring	-
Supervision during an internship	-
Examinations / Assignments	20 / 180

Degree programme year 3 (excluding Minor)	
Structure contact hours	**Contact hours per year**
Lectures	36
Tutorial / Practicals	16 / 118
Tutoring	-
Supervision during an internship	-
Examinations	4
BSc Research Project	400

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 of Chemistry. The Board of Examiners will evaluate whether the proposed curriculum meets the learning outcomes of the degree programme.

Appendix VII. Transitional provisions (art. 12.1)

For Cohort 2024-25 and earlier

Course	May be replaced with	Info
Biomacromolecular Chemistry and Analysis (WBCH061-05)	(Bio)Synthesis and Analysis 3 (WBCH071-05)	Course changes due to the Smarter Academic Year for year 2. Additional components do not need to be taken if Synthesis 2 completed prior to 25/26.
Macromolecular Chemistry (WBCH023-05)	Polymer chemistry WBCE037-05 in block 2a of 25/26	Course will be given in 25/26 in block 1b. Option to replace course with CE course in 2a.
Electrochemistry and Energy (WBCH037-05)	Electrochemical technology WBCE021-05	Course will not be given after 24/25