Programme-specific Section of the Curriculum for the MSc Programme in Chemistry at the Faculty of Science, University of Copenhagen 2013 (Rev 2022)

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1 Title, affiliation and language
A shared section that applies to all BSc and MSc Programmes at the Faculty of Science is linked to this programme-specific curriculum.

1.1 Title
The MSc Programme in Chemistry leads to a Master of Science (MSc) in Chemistry with the Danish title: Cand.scient. (candidatus/candidata scientiarum) i kemi.

1.2 Affiliation
The programme is affiliated with the Study Board of Physics, Chemistry and Nanoscience, and the students can both elect, and be elected, to this study board.

1.3 Corps of external examiners
The following corps of external examiners is used for the central parts of the MSc Programme:
- Corps of External Examiners for Chemistry (kemi).

1.4 Language
The language of this MSc Programme is English.

2 Academic profile
2.1 Purpose
The objective of the programme is to provide the graduates with an in-depth knowledge within the methods and scientific basis of chemical research. The education is based on the competences the students have acquired during the MSc programme. On completion of the programme, students will be able to perform research at advanced levels; analyse and solve problems within the broad field of chemistry. A master’s degree in chemistry equips the graduates with the necessary skills for participating in research groups or for the independent leadership and management of complex work and development situations within the field. The MSc Programme in Chemistry combines formal coursework with independent research guided by an experienced researcher.

2.2 General programme profile
The MSc Programme in Chemistry is a research-based education. The master’s programme in chemistry has four specializations: Inorganic Chemistry, Organic Synthesis, Physical Chemistry and Analytical Chemistry. In each of the specialization there are 30 ECTS obligatory courses which will give the graduate in-depth knowledge within the methods and scientific basis of chemical research in the given specialisation. The thesis work is experimental in nature, e.g. it must include experimental work or production of scientific work in terms of the generation of original data and/or original material.

Chemistry is the key subject area of the programme.

2.3 General structure of the programme
The MSc Programme is set at 120 ECTS.

The MSc Programme in Chemistry consists of the following elements:
- Specialisation, 120 ECTS, including the thesis.
The student must choose one of the following specialisations:

- Analytical Chemistry.
- Inorganic Chemistry.
- Organic Synthesis.
- Physical Chemistry.

2.4 Career opportunities
The MSc Programme in Chemistry qualifies students to become professionals within business functions and/or areas such as:

- A PhD programme
- The private sector such as chemical or pharmaceutical companies.
- High-tech companies.
- Consulting companies.
- The public sector.
- Universities.
- Sector Research Institute.
- Prerequisites for further studies, including a PhD program.

3 Description of competence profiles
Students following the MSc Programme acquire the knowledge, skills and competences listed below. Students will also acquire other qualifications through elective subject elements and other study activities.

3.1 Analytical Chemistry
Graduates holding an MSc in Chemistry with a specialisation in Analytical Chemistry have acquired the following:

Knowledge about:

- A solid theoretical understanding of sampling theory and sample preparation methods, chromatography and mass spectrometry, spectroscopic methods.
- Practical use of advanced analytical techniques for analysis of gas, liquid and solid samples.
- Quantitative and qualitative chemical analyses.
- Method development, validation and quality control of chemical analyses.

Skills in/to:

- Plan sampling experiments and analyse the results.
- Plan, perform and optimize sample preparation for organic compounds and elements in simple and complex matrices.
- Develop and apply methods for separating chemical compounds in mixtures using chromatography and related methods.
- Develop sustainable analytical methods (green chemistry)
- Perform quantitative and qualitative chemical analysis of organic compounds and elements in gas, liquid and solid matrices.
- Apply data science in analytical chemistry (digitalization, data processing and evaluation).
- Critically assess reported analytical chemistry research including chromatographic, mass spectrometry, and spectroscopy research.
- Select a suitable analytical platform for the separation, detection and quantification of analytes from complex matrices on the basis of chemical properties of the analyte and knowledge of the matrix.
Competences in/to:

- Be able to critically read papers in current international advanced analytical chemistry journals.
- Enable the student to plan and perform: sampling, sample preparation of complex matrices, chemical analysis of simple and complex mixtures of chemicals and elements using modern analytical chromatography, mass spectrometry spectroscopy methods, data science methods for qualitative (identification) and quantitative (concentration measurements) analysis.
- Be able to develop, validate and quality assure new analytical methods.

### 3.2 Inorganic Chemistry

Graduates holding an MSc in Chemistry with a specialisation in Inorganic Chemistry have acquired the following:

**Knowledge about:**
- Inorganic and coordination chemistry broadly.
- Synthesis, compound properties, element occurrences and The Periodic Table as a resource map including sustainability issues.
- Important electronic structure models
- Modern experimental techniques in modern inorganic chemistry.

**Skills in/to:**
- Describe the most important experimental techniques applied in the characterisation of inorganic compounds.
- Describe and rationalise the most important periodic variation in the chemical and physical properties of the elements and their compounds.
- Understand thermodynamic and kinetic factors in inorganic chemistry and their consequences for structure reactivity and catalysis.

**Competences in/to:**
- Discuss descriptive inorganic chemistry and important models applied to inorganic chemistry.
- Analyse optical, magnetic, electric and other physical properties of inorganic compounds.
- Analyse scientific papers with inorganic synthetic problems.
- Analyse and suggest preparative strategies and substitution options for inorganic compounds.

### 3.3 Organic Synthesis

Graduates holding an MSc in Chemistry with a specialisation in Organic Synthesis have acquired the following:

**Knowledge about:**
- Physical organic chemistry.
- Outcome and application of reactions and synthesis employed in advanced organic and medicinal chemistry.
- Modern techniques for synthesis of advanced organic and inorganic small-molecules.
- Sustainability of chemical processes.
Skills in/to:
- Elucidate the reaction mechanisms of the desired and undesired organic reactions.
- Predict the conditional dependence of yield and stereochemistry in organic reactions.
- Select the optimal starting materials and conditions in synthesis of drugs.
- Work independently with specialised equipment and advanced synthesis methods.
- Work with synthetic chemistry under inert atmosphere, anhydrous condition and extreme condition (temperature, pressure, etc.).
- Work with various type of chromatographic purification methods.

Competences in/to:
- Analyse reactions on the basis of physical organic chemistry, particularly electronegativities of the elements involved.
- Analyse scientific papers and patents dealing with synthetic problems.
- Analyse a complex synthetic problem and plan a feasible synthesis considering sustainable and green chemistry perspectives.
- Make educated choice regarding the use the advanced techniques, methodologies and advanced equipment.
- Make educated choice regarding the execution of the chemical reactions and purification methods.

3.4 Physical Chemistry
Graduates holding an MSc in Chemistry with a specialisation in Physical Chemistry have acquired the following:

Knowledge about:
- Computational chemistry.
- Experimental and theoretical advanced physical chemical methods.
- Experimental techniques used in gas, liquid and solid phase spectroscopy.

Skills in/to:
- Establish, evaluate and complete a theoretical investigation of a chemical problem using modern scientific computing software within chemistry.
- Use of basic spectroscopic instruments and to describe different techniques and the theory behind them.

Competences in/to:
- Be able to critically read papers in current international computational and physical chemistry journals.
- Discuss a concrete computation chemistry problem and utilise the most efficient and suitable calculation method to solve the problem.
- Assess the usefulness of different spectroscopic techniques to solve different research questions.
- Be critical and insightful in relation to the digital data obtained by experiments.

4 Admission requirements
With a Bachelor’s degree in Chemistry from the University of Copenhagen the student is granted reserved access and guaranteed a place on the MSc Programme in Chemistry if the student applies in time to begin the MSc Programme within three years of the completion of the Bachelor's degree.

4.1 Applicants with a Bachelor’s degree in Chemistry
Applicants with a Bachelor’s degree in Chemistry from one of the following:
• Danish universities: University of Copenhagen, Aarhus University, University of Southern Denmark
• Nordic universities: Lund University, Stockholm University, University of Uppsala, University of Oslo, University of Tromsø, Norwegian University of Science and Technology, University of Iceland, University of Helsinki.

are directly academically qualified for admission to the MSc Programme in Chemistry.

4.2 Applicants with a Bachelor’s degree in Nanoscience
Applicants with a Bachelor’s degree in Nanoscience from the University of Copenhagen are directly academically qualified for admission to the MSc Programme in Chemistry.

4.3 Applicants with a Bachelor’s degree in Biochemistry
Applicants with a Bachelor’s degree in Biochemistry from the University of Copenhagen may also be admitted if their programme includes the following:

• General and inorganic chemistry (min. 15 ECTS)
• Organic chemistry (min. 15 ECTS)
• Analytical chemistry and spectroscopy (min. 7.5 ECTS)
• Chemical synthesis (min. 7.5 ECTS)
• Physical chemistry (including quantum chemistry) (min. 15 ECTS)

The elements must account for a total of min. 60 ECTS and each of them must include laboratory teaching, including laboratory safety.

4.4 Applicants with a related Bachelor's degree
Applicants with a Bachelor’s degree in related areas from the University of Copenhagen or other Danish, Nordic or international universities may also be admitted if their programme includes the following:

• General and inorganic chemistry (min. 15 ECTS)
• Organic chemistry (min. 15 ECTS)
• Analytical chemistry and spectroscopy (min. 7.5 ECTS)
• Chemical synthesis (min. 7.5 ECTS)
• Physical chemistry (including quantum chemistry) (min. 15 ECTS)

The elements must account for a total of min. 60 ECTS and each of them must include laboratory teaching, including laboratory safety.

4.4 Other applicants
The Faculty may also admit applicants who, after an individual academic assessment, are assessed to possess educational qualifications equivalent to those required in Subclauses 4.1-4.

4.5 Language requirements
Applicants must as a minimum document English language qualifications comparable to a Danish upper secondary school English B level or English proficiency corresponding to the tests and scores required. Accepted tests and required minimum scores are published online at www.science.ku.dk.

4.6 Supplementary subject elements
The qualifications of an applicant to the MSc programme are assessed exclusively on the basis of the qualifying bachelor’s degree. Supplementary subject elements passed between the
completion of the bachelor’s programme and the admission to the MSc programme cannot be included in the overall assessment.

However, subject elements passed before the completion of the bachelor’s programme may be included in the overall assessment. This includes subject elements completed as continuing education as well as subject elements completed as part of a former higher education programme. A maximum of 30 ECTS supplementary subject elements can be included in the overall assessment.

Subject elements passed before completing the BSc programme which are to form part of the MSc programme to which the student has a legal right of admission (§12-courses) cannot be included in the overall assessment.

5 Prioritisation of applicants
If the number of qualified applicants to the programme exceeds the number of places available, applicants will be prioritised as follows:

1) Applicants with a Bachelor’s degree in Chemistry from the University of Copenhagen with reserved access to the programme.
2) Applicants with a Bachelor’s degree in Chemistry from the University of Copenhagen.
3) Applicants with a Bachelor’s degree in Chemistry.
4) Applicants with a Bachelor’s degree in Nanoscience from the University of Copenhagen.
5) Applicants with a Bachelor’s degree in Biochemistry from the University of Copenhagen.
6) Other applicants.

If the number of qualified applicants within a category exceeds the number of places available, applicants will be prioritised according to the following criteria (listed below in prioritised order):

- Total number of ECTS within the relevant academic fields listed in Subclause 4.3.
- Grades obtained within the relevant academic fields listed in Subclause 4.3.

6 Structure of the programme
The compulsory subject elements, restricted elective subject elements and the thesis constitute the central parts of the programme (Section 30 of the Ministerial Order on Bachelor and Master’s Programmes (Candidatus) at Universities).

Before the beginning of the MSc Programme the student must choose a specialisation.

6.1 Analytical Chemistry
The specialisation is set at 120 ECTS and consists of the following:

- Compulsory subject elements, 30 ECTS.
- Elective subject elements, 30 ECTS.
- Thesis, 60 ECTS.
### 6.1.1 Compulsory subject elements

All of the following subject elements are to be covered (30 ECTS):

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Block</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPLK13003U</td>
<td>Advanced Analytic Chemistry – Sampling and Sample Preparation</td>
<td>Block 1</td>
<td>7.5 ECTS</td>
</tr>
<tr>
<td>NKEA09010U</td>
<td>Scientific Writing, Planning and Presentation</td>
<td>Block 1</td>
<td>7.5 ECTS</td>
</tr>
<tr>
<td>NPLK13004U</td>
<td>Advanced Analytic Chemistry – Chromatography and Mass Spectrometry</td>
<td>Block 2</td>
<td>7.5 ECTS</td>
</tr>
<tr>
<td>NPLK16003U</td>
<td>Experimental Analytical Chemistry: Method Development and Quality Assurance</td>
<td>Block 2</td>
<td>7.5 ECTS</td>
</tr>
</tbody>
</table>

### 6.1.2 Elective subject elements

30 ECTS are to be covered as elective subject elements.

- All subject elements at MSc level may be included as elective subject elements in the MSc Programme.
- BSc subject elements corresponding to 15 ECTS may be included in the MSc Programme.
- Projects. See 6.1.3 Projects.

### 6.1.3 Projects

Projects outside the course scope, projects in practice and thesis preparation projects may not exceed 45 ECTS of the programme.

- Projects outside the course scope may be included in the elective section of the programme with up to 15 ECTS. The regulations are described in Appendix 5 to the shared section of the curriculum.
- Projects in practice may be included in the elective section of the programme with up to 15 ECTS. The regulations are described in Appendix 4 to the shared section of the curriculum.
- Thesis preparation projects may be included in the elective section of the programme with up to 15 ECTS. The regulations are described in Appendix 6 to the shared section of the curriculum.

### 6.1.4 Thesis

The MSc Programme in Chemistry with a specialisation in Analytical Chemistry includes a thesis corresponding to 60 ECTS, as described in Appendix 2 to the shared curriculum. The thesis must be written within the academic scope of the programme.

### 6.1.5 Academic mobility

The curriculum makes it possible to follow subject elements outside the Faculty of Science.

For students admitted in September the academic mobility in the MSc Programme in Chemistry with a specialisation in Analytical Chemistry is placed in block 3+4 of the 1st year.

For students admitted in February the academic mobility in the MSc Programme in Chemistry with a specialisation in Analytical Chemistry is placed in block 3+4 of the 1st year.

Academic mobility requires that the student follows the rules and regulations regarding pre-approval and credit transfer.

In addition the student has the possibility to arrange similar academic mobility in other parts of the programme.
6.2 Inorganic Chemistry
The specialisation is set at 120 ECTS and consists of the following:

- Compulsory subject elements, 30 ECTS.
- Elective subject elements, 30 ECTS.
- Thesis, 60 ECTS.

6.2.1 Compulsory subject elements
All of the following subject elements are to be covered (30 ECTS):

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Block</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>NKEK15003U</td>
<td>Methods and Modelling in Inorganic Chemistry</td>
<td>Block 1+2</td>
<td>15 ECTS</td>
</tr>
<tr>
<td>NKEK15004U</td>
<td>Descriptive Inorganic Chemistry</td>
<td>Block 3+4</td>
<td>15 ECTS</td>
</tr>
</tbody>
</table>

6.2.2 Elective subject elements
30 ECTS are to be covered as elective subject elements.

- All subject elements at MSc level may be included as elective subject elements in the MSc Programme.
- BSc subject elements corresponding to 15 ECTS may be included in the MSc Programme.
- Projects. See 6.2.3 Projects.

6.2.3 Projects
Projects outside the course scope, projects in practice and thesis preparation projects may not exceed 45 ECTS of the programme.

- Projects outside the course scope may be included in the elective section of the programme with up to 15 ECTS. The regulations are described in Appendix 5 to the shared section of the curriculum.
- Projects in practice may be included in the elective section of the programme with up to 15 ECTS. The regulations are described in Appendix 4 to the shared section of the curriculum.
- Thesis preparation projects may be included in the elective section of the programme with up to 15 ECTS. The regulations are described in Appendix 6 to the shared section of the curriculum.

6.2.4 Thesis
The MSc Programme in Chemistry with a specialisation in Inorganic Chemistry includes a thesis corresponding to 60 ECTS, as described in Appendix 2 to the shared curriculum. The thesis must be written within the academic scope of the programme.

6.2.5 Academic mobility
The curriculum makes it possible to follow subject elements outside the Faculty of Science.

For students admitted in September the academic mobility in the MSc Programme in Chemistry with a specialisation in Inorganic Chemistry is placed in block 1+2 of the 1st year.

For students admitted in February the academic mobility in the MSc Programme in Chemistry with a specialisation in Inorganic Chemistry is placed in block 3+4 of the 1st year.

Academic mobility requires that the student follows the rules and regulations regarding pre-approval and credit transfer.

In addition the student has the possibility to arrange similar academic mobility in other parts of the programme.
6.3 Organic Synthesis
The specialisation is set at 120 ECTS and consists of the following:

- Compulsory subject elements, 30 ECTS.
- Elective courses, 30 ECTS.
- Thesis, 60 ECTS.

6.3.1 Compulsory subject elements
All of the following subject elements are to be covered (30 ECTS):

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Block</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>NKEK13007U</td>
<td>Reaction and Synthesis in Medicinal Chemistry (KemiMed)</td>
<td>Block 1+2</td>
<td>15 ECTS</td>
</tr>
<tr>
<td>NKEK13006U</td>
<td>Organic Chemistry</td>
<td>Block 3+4</td>
<td>15 ECTS</td>
</tr>
</tbody>
</table>

6.3.2 Elective subject elements
30 ECTS are to be covered as elective subject elements.

- All subject elements at MSc level may be included as elective subject elements in the MSc Programme.
- BSc subject elements corresponding to 15 ECTS may be included in the MSc Programme.
- Projects. See 6.3.3 Projects.

6.3.3 Projects
Projects outside the course scope, projects in practice and thesis preparation projects may not exceed 45 ECTS of the programme.

- Projects outside the course scope may be included in the elective section of the programme with up to 15 ECTS. The regulations are described in Appendix 5 to the shared section of the curriculum.
- Projects in practice may be included in the elective section of the programme with up to 15 ECTS. The regulations are described in Appendix 4 to the shared section of the curriculum.
- Thesis preparation projects may be included in the elective section of the programme with up to 15 ECTS. The regulations are described in Appendix 6 to the shared section of the curriculum.

6.3.4 Thesis
The MSc Programme in Chemistry with a specialisation in Organic Chemistry includes a thesis corresponding to 60 ECTS, as described in Appendix 2 to the shared curriculum. The thesis must be written within the academic scope of the programme.

6.3.5 Academic mobility
The curriculum makes it possible to follow subject elements outside the Faculty of Science.

For students admitted in September the academic mobility in the MSc Programme in Chemistry with a specialisation in Organic Chemistry is placed in block 1+2 of the 1st year.

For students admitted in February the academic mobility in the MSc Programme in Chemistry with a specialisation in Organic Chemistry is placed in block 3+4 of the 1st year.

Academic mobility requires that the student follows the rules and regulations regarding pre-approval and credit transfer.

In addition the student has the possibility to arrange similar academic mobility in other parts of the programme.
6.4 Physical Chemistry
The specialisation is set at 120 ECTS and consists of the following:

- Compulsory subject elements, 30 ECTS.
- Elective subject elements, 30 ECTS.
- Thesis, 60 ECTS.

### 6.4.1 Compulsory subject elements
All of the following subject elements are to be covered (30 ECTS):

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Block</th>
<th>ECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>NKEA07016U</td>
<td>Computational Chemistry</td>
<td>Block 1+2</td>
<td>15 ECTS</td>
</tr>
<tr>
<td>NKEK22001U</td>
<td>Advanced Vibrational Spectroscopy</td>
<td>Block 3</td>
<td>7.5 ECTS</td>
</tr>
<tr>
<td>NKEK22000U</td>
<td>Advanced Fluorescence Spectroscopy and Microscopy</td>
<td>Block 4</td>
<td>7.5 ECTS</td>
</tr>
</tbody>
</table>

### 6.4.2 Elective subject elements
30 ECTS are to be covered as elective subject elements.
- All subject elements at MSc level may be included as elective subject elements in the MSc Programme.
- BSc subject elements corresponding to 15 ECTS may be included in the MSc Programme.
- Projects. See 6.4.3 Projects.

### 6.4.3 Projects
Projects outside the course scope, projects in practice and thesis preparation projects may not exceed 45 ECTS of the programme.
- Projects outside the course scope may be included in the elective section of the programme with up to 15 ECTS. The regulations are described in Appendix 5 to the shared section of the curriculum.
- Projects in practice may be included in the elective section of the programme with up to 15 ECTS. The regulations are described in Appendix 4 to the shared section of the curriculum.
- Thesis preparation projects may be included in the elective section of the programme with up to 15 ECTS. The regulations are described in Appendix 6 to the shared section of the curriculum.

### 6.4.4 Thesis
The MSc Programme in Chemistry with a specialisation in Physical Chemistry includes a thesis corresponding to 60 ECTS, as described in Appendix 2 to the shared curriculum. The thesis must be written within the academic scope of the programme.

### 6.4.5 Academic mobility
The curriculum makes it possible to follow subject elements outside the Faculty of Science.

For students admitted in September the academic mobility for the MSc Programme in Chemistry with a specialisation in Physical Chemistry is placed in block 1+2 of the 1st year.

For students admitted in February the academic mobility for the MSc Programme in Chemistry with a specialisation in Physical Chemistry is placed in block 3+4 of the 1st year.
Academic mobility requires that the student follows the rules and regulations regarding pre-approval and credit transfer.

In addition the student has the possibility to arrange similar academic mobility in other parts of the programme.

7 Exemptions
In exceptional circumstances, the study board may grant exemptions from the rules in the curriculum specified solely by the Faculty of Science.

8 Commencement etc.
8.1 Validity
This subject specific section of the curriculum applies to all students enrolled in the programme – see however Appendix 2.

8.2 Transfer
Students enrolled on previous curricula may be transferred to the new one as per the applicable transfer regulations or according to an individual credit transfer by the study board.

8.3 Amendment
The curriculum may be amended once a year so that any changes come into effect at the beginning of the academic year. Amendments must be proposed by the study board and approved by the Dean.

Notification about amendments that tighten the admission requirements for the programme will be published online at www.science.ku.dk one year before they come into effect.

If amendments are made to this curriculum, an interim arrangement may be added if necessary to allow students to complete their MSc Programme according to the amended curriculum.
Appendix 1 The recommended academic progression
The table illustrates the recommended academic progression. The student is allowed to plan an alternative progression within the applicable rules.

Tables for students admitted to the programme in September (summer):

### Table – Analytical Chemistry

<table>
<thead>
<tr>
<th></th>
<th>Block 1</th>
<th>Block 2</th>
<th>Block 3</th>
<th>Block 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st year</td>
<td>Scientific Writing, Planning and Presentation</td>
<td>Experimental Analytical Chemistry: Method Development and Quality</td>
<td>Elective</td>
<td>Elective</td>
</tr>
<tr>
<td></td>
<td>Advanced Analytic Chemistry – Sampling and Sample Preparation</td>
<td>Advanced Analytic Chemistry – Chromatography and Mass Spectrometry</td>
<td>Elective</td>
<td>Elective</td>
</tr>
<tr>
<td>2nd year</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Thesis</td>
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</tbody>
</table>

### Table – Inorganic Chemistry

<table>
<thead>
<tr>
<th></th>
<th>Block 1</th>
<th>Block 2</th>
<th>Block 3</th>
<th>Block 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st year</td>
<td>Methods and Modelling in Inorganic Chemistry</td>
<td>Descriptive Inorganic Chemistry</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Elective</td>
<td>Elective</td>
<td>Elective</td>
<td>Elective</td>
</tr>
<tr>
<td>2nd year</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
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<td></td>
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<td>Thesis</td>
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</table>

### Table – Organic Synthesis

<table>
<thead>
<tr>
<th></th>
<th>Block 1</th>
<th>Block 2</th>
<th>Block 3</th>
<th>Block 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st year</td>
<td>Elective</td>
<td>Elective</td>
<td>Elective</td>
<td>Elective</td>
</tr>
<tr>
<td></td>
<td>Reaction and Synthesis in Medicinal Chemistry</td>
<td></td>
<td>Organic Chemistry</td>
<td></td>
</tr>
<tr>
<td>2nd year</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Thesis</td>
</tr>
</tbody>
</table>
### Table – Physical Chemistry

<table>
<thead>
<tr>
<th>Year</th>
<th>Block 1</th>
<th>Block 2</th>
<th>Block 3</th>
<th>Block 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>Elective</td>
<td>Elective</td>
<td>Elective</td>
<td>Elective</td>
</tr>
<tr>
<td></td>
<td><strong>Computational Chemistry</strong></td>
<td><strong>Advanced Vibrational Spectroscopy</strong></td>
<td><strong>Advanced Fluorescence Spectroscopy and Microscopy</strong></td>
<td></td>
</tr>
<tr>
<td>2nd</td>
<td></td>
<td></td>
<td></td>
<td><strong>Thesis</strong></td>
</tr>
</tbody>
</table>

### Tables for students admitted to the programme in February (winter):

#### Table – Analytical Chemistry*

<table>
<thead>
<tr>
<th>Year</th>
<th>Block 3</th>
<th>Block 4</th>
<th>Block 1</th>
<th>Block 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>Elective</td>
<td>Elective</td>
<td><strong>Scientific Writing, Planning and Presentation</strong></td>
<td><strong>Experimental Analytical Chemistry: Method Development and Quality Assurance</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Advanced Analytic Chemistry – Sampling and Sample Preparation</strong></td>
<td><strong>Advanced Analytic Chemistry-Chromatography and Mass Spectrometry</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd</td>
<td></td>
<td></td>
<td><strong>Thesis</strong></td>
<td></td>
</tr>
</tbody>
</table>

* This table is only relevant for students who begin the MSc Programme in February (block 3)

#### Table – Inorganic Chemistry*

<table>
<thead>
<tr>
<th>Year</th>
<th>Block 3</th>
<th>Block 4</th>
<th>Block 1</th>
<th>Block 2</th>
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</thead>
<tbody>
<tr>
<td>1st</td>
<td><strong>Descriptive Inorganic Chemistry</strong></td>
<td><strong>Methods and Modelling in Inorganic Chemistry</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Elective</td>
<td>Elective</td>
<td>Elective</td>
<td>Elective</td>
</tr>
<tr>
<td>2nd</td>
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<td></td>
<td><strong>Thesis</strong></td>
<td></td>
</tr>
</tbody>
</table>

* This table is only relevant for students who begin the MSc Programme in February (block 3)
### Table – Organic Synthesis*

<table>
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<th>Block 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st year</td>
<td>Elective</td>
<td>Elective</td>
<td>Elective</td>
<td>Elective</td>
</tr>
<tr>
<td></td>
<td>Organic Chemistry</td>
<td></td>
<td></td>
<td>Reaction and Synthesis in Medicinal Chemistry</td>
</tr>
<tr>
<td>2nd year</td>
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<td>Thesis</td>
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* This table is only relevant for students who begin the MSc Programme in February (block 3)

### Table – Physical Chemistry*

<table>
<thead>
<tr>
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<th>Block 3</th>
<th>Block 4</th>
<th>Block 1</th>
<th>Block 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st year</td>
<td>Elective</td>
<td>Elective</td>
<td>Elective</td>
<td>Elective</td>
</tr>
<tr>
<td></td>
<td>Advanced Vibrational Spectroscopy</td>
<td>Advanced Fluorescence Spectroscopy and Microscopy</td>
<td>Computational Chemistry</td>
<td></td>
</tr>
<tr>
<td>2nd year</td>
<td></td>
<td></td>
<td></td>
<td>Thesis</td>
</tr>
</tbody>
</table>

* This table is only relevant for students who begin the MSc Programme in February (block 3)
Appendix 2 Interim arrangements

The Shared Section of the BSc and MSc Curricula for Study Programmes applies to all students.

The interim arrangements below only consist of parts where the current curriculum differs from the rules and regulations that were previously valid. Therefore, if information about relevant rules and regulations are missing, it can be found in the curriculum above.

1 General changes for students admitted in the academic year 2021/22

Students admitted to the MSc Programme in the academic year 2021/22 must finish the programme as listed in the curriculum above with the following exceptions.

1.1 Physical Chemistry

The specialisation is set at 120 ECTS and consists of the following:

- Compulsory subject elements, 30 ECTS.
- Elective subject elements, 30 ECTS.
- Thesis, 60 ECTS.

Table – Physical Chemistry (students admitted in September)

<table>
<thead>
<tr>
<th>1st year</th>
<th>Block 1</th>
<th>Block 2</th>
<th>Block 3</th>
<th>Block 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elective</td>
<td>Elective</td>
<td>Elective</td>
<td>Elective</td>
<td>Elective</td>
</tr>
<tr>
<td>Computational Chemistry</td>
<td>Advanced Molecular Spectroscopy</td>
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<td></td>
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</table>

| 2nd year | Thesis |

Subject elements in italics have been discontinued. See discontinued courses below.

Table – Physical Chemistry (students admitted in February)

<table>
<thead>
<tr>
<th>1st year</th>
<th>Block 3</th>
<th>Block 4</th>
<th>Block 1</th>
<th>Block 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elective</td>
<td>Elective</td>
<td>Elective</td>
<td>Elective</td>
<td>Elective</td>
</tr>
<tr>
<td>Advanced Molecular Spectroscopy</td>
<td>Computational Chemistry</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| 2nd year | Thesis |

Subject elements in italics have been discontinued. See discontinued courses below.

2 General changes for students admitted in the academic year 2020/21

Students admitted to the MSc Programme in the academic year 2020/21 must finish the programme as listed in the curriculum above with the following exceptions.
2.1 Physical Chemistry
The specialisation is set at 120 ECTS and consists of the following:
- Compulsory subject elements, 30 ECTS.
- Elective subject elements, 30 ECTS.
- Thesis, 60 ECTS.

Table – Physical Chemistry (students admitted in September)

<table>
<thead>
<tr>
<th></th>
<th>Block 1</th>
<th>Block 2</th>
<th>Block 3</th>
<th>Block 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st year</td>
<td>Elective</td>
<td>Elective</td>
<td>Elective</td>
<td>Elective</td>
</tr>
<tr>
<td></td>
<td>Computational Chemistry</td>
<td>Advanced Physical Chemistry</td>
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<td></td>
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<tr>
<td>2nd year</td>
<td></td>
<td></td>
<td>Thesis</td>
<td></td>
</tr>
</tbody>
</table>

Subject elements in italics have been discontinued. See discontinued courses below.

Table – Physical Chemistry (students admitted in February)

<table>
<thead>
<tr>
<th></th>
<th>Block 3</th>
<th>Block 4</th>
<th>Block 1</th>
<th>Block 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st year</td>
<td>Elective</td>
<td>Elective</td>
<td>Elective</td>
<td>Elective</td>
</tr>
<tr>
<td></td>
<td>Advanced Physical Chemistry</td>
<td>Computational Chemistry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd year</td>
<td></td>
<td></td>
<td>Thesis</td>
<td></td>
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</table>

Subject elements in italics have been discontinued. See discontinued courses below.

3 Discontinued courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>ECTS</th>
<th>Interim arrangement</th>
</tr>
</thead>
<tbody>
<tr>
<td>NKEK21001U</td>
<td>Advanced Molecular Spectroscopy</td>
<td>15</td>
<td>The course was compulsory on the specialisation in Physical Chemistry in the academic year XX. Offered for the last time: 2021/22. Last exam if applicable (cf. SCIENCE's Teaching and exam rules): 2022/23. The course is replaced by Advanced Vibrational Spectroscopy (NKEK22001U) + Advanced Fluorescence Spectroscopy and Microscopy (NKEK22000U), 7.5 ECTS.</td>
</tr>
<tr>
<td>NKEK10004U</td>
<td>Advanced Physical Chemistry</td>
<td>15</td>
<td>The course was compulsory on the specialisation in Physical Chemistry in the academic year 2020/21, 2019/20, 2018/19 and 2017/18. Offered for the last time: 2020/21. Last exam if applicable (cf. SCIENCE's Teaching and exam rules): 2020/21. The course is identical to Advanced Molecular Spectroscopy (NKEK21001U), 15 ECTS.</td>
</tr>
</tbody>
</table>
Appendix 3 Description of objectives for the thesis

After completing the thesis, the student should have:

Knowledge about:
- Acquired knowledge and learned appropriate methods within selected areas in chemistry of active research.
- Acquired in-depth knowledge of selected areas in chemistry at an international level by conducting independent research and working under supervision.

Skills in/to:
- Read and understand original academic literature in the field of chemistry.
- Explain chemistry work, both orally and in writing.
- Identify, define and formulate the scientific issue/impact of a research project.
- Define and develop testable hypotheses.
- Process and analyse data.

Competences in/to:
- Formulate, structure and manage a research project involving the development and use of chemical methods.
- Manage complex work and development situations.
- Seek out and summarise the available knowledge in selected areas of chemistry.
- Assess chemical methods, and their application and limitations.
- Discuss chemical methods, theory and results, both in general and on a scientific level.
- Discuss the application of chemical results in an industrial, social and ethical context in an academic manner.
- Take independent responsibility for own academic development and specialisation.