Module Catalogue
for the Subject
Chemistry
as a Master’s with 1 major
with the degree "Master of Science"
(120 ECTS credits)

Examination regulations version: 2010
Responsible: Faculty of Chemistry and Pharmacy
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### Module Catalogue for the Subject Chemistry

**Master’s with 1 major, 120 ECTS credits**

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Master's Thesis 153

Master's Thesis 154
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Content and Objectives of the Programme

The Master's program in Chemistry is offered by the Faculty of Chemistry and Pharmacy of the JMU as a fundamentally-oriented course with the degree of "Master of Science" (M.Sc.), in the context of a consecutive Bachelor's and Master's degree program.

The Master's course prepares students for scientific as well as doctoral work in chemistry and the eventual award of the degree Dr. rer. nat. The aim of the training is to provide students with in-depth knowledge of scientific work in the research and application of chemistry and the associated basic concepts. Through the education and training of analytical thinking, students should acquire the ability to independently apply the basic knowledge obtained earlier in their Bachelor studies and to transfer it to, and later familiarize themselves with, a wide variety of new tasks.

Through the thesis, students should show that they are able to deal with an experimental or theoretical task in a thematically-limited extent using known methods and from a scientific point of view. The Master's examination intends to determine whether the candidate or the candidate has an overview of the relationships in chemistry, and has the ability to apply the learned scientific methods. It allows the acquisition of an internationally comparable degree in the field of chemistry and provides a professional qualification to prepare for future work in research and development.
Abbreviations used

Course types: E = field trip, K = colloquium, O = conversatorium, P = placement/lab course, R = project, S = seminar, T = tutorial, Ü = exercise, V = lecture

Term: SS = summer semester, WS = winter semester

Methods of grading: NUM = numerical grade, B/NB = (not) successfully completed

Regulations: (L)ASPO = general academic and examination regulations (for teaching-degree programmes), FSB = subject-specific provisions, SFB = list of modules

Other: A = thesis, LV = course(s), PL = assessment(s), TN = participants, VL = prerequisite(s)

Conventions

Unless otherwise stated, courses and assessments will be held in German, assessments will be offered every semester and modules are not creditable for bonus.

Notes

Should there be the option to choose between several methods of assessment, the lecturer will agree with the module coordinator on the method of assessment to be used in the current semester by two weeks after the start of the course at the latest and will communicate this in the customary manner.

Should the module comprise more than one graded assessment, all assessments will be equally weighted, unless otherwise stated below.

Should the assessment comprise several individual assessments, successful completion of the module will require successful completion of all individual assessments.

In accordance with

the general regulations governing the degree subject described in this module catalogue:

ASPO2009

associated official publications (FSB (subject-specific provisions)/SFB (list of modules)):

14-Jul-2010 (2010-31)

This module handbook seeks to render, as accurately as possible, the data that is of statutory relevance according to the examination regulations of the degree subject. However, only the FSB (subject-specific provisions) and SFB (list of modules) in their officially published versions shall be legally binding. In the case of doubt, the provisions on, in particular, module assessments specified in the FSB/SFB shall prevail.
Compulsory Electives
(90 ECTS credits)

Divided up into 3 focus subjects (25 ECTS credits each) + additional qualifications (15 ECTS credits).
Inorganic Chemistry
(25 ECTS credits)
Compulsory Courses
(20 ECTS credits)
Advanced Inorganic Chemistry

Abbreviation: 08-ACM1-102-m01

Module coordinator: Director of the Institute of Inorganic Chemistry
Module offered by: Institute of Inorganic Chemistry

ECTS: 20
Method of grading: Only after successful completion of module(s)

Duration: 2 semester
Module level: Graduate
Other prerequisites: --

Contents
This module discusses advanced topics in main group chemistry and transition metal chemistry. It focuses on special compounds of the main group elements (MGEs), bonding situations of MGEs and MGE compounds, the chemistry of transition metals and coordination chemistry. The course gives students the opportunity to enhance their skills in advanced synthesis and analytical methods in inorganic chemistry. The focus will be on working under inert atmospheres, purification methods, spectral analysis and crystallography. Students are expected to conduct their work independently, write a lab report documenting their findings and deliver a presentation.

Intended learning outcomes
Students are able to characterise and explain special compounds of the main group elements. They can describe the chemical properties of transition metals and analyse the structure as well as chemical and physical aspects of coordination compounds. Students are able to use advanced synthesis and analytical methods in inorganic chemistry in the lab and to interpret their findings. They are able to write a lab report documenting their findings and deliver a presentation.

Courses
This module comprises 2 module components. Information on courses will be listed separately for each module component.
- 08-ACM1-1-102: S + S (no information on SWS (weekly contact hours) and course language available)
- 08-ACM1-2-102: P (no information on SWS (weekly contact hours) and course language available)

Method of assessment
Assessment in this module comprises the assessments in the individual module components as specified below. Unless stated otherwise, successful completion of the module will require successful completion of all individual assessments.

Assessment in module component 08-ACM1-1-102: Inorganic Chemistry for advanced students
- 10 ECTS, Method of grading: numerical grade
- a) 1 to 3 written examinations (90 to 120 minutes each) or b) oral examination of one candidate each (30 minutes) or c) oral examination in groups (groups of 2, 45 minutes)
- Language of assessment: German or English

Assessment in module component 08-ACM1-2-102: Inorganic Chemistry practical course for advanced
- 10 ECTS, Method of grading: not successfully completed
- practical work with lab report (20 pages) and talk (15 minutes)
- Language of assessment: German or English

Additional information
--

Referred to in LPO I (examination regulations for teaching-degree programmes)
--
Compulsory Electives
(5 ECTS credits)
### Module title

Bioinorganic Chemistry

### Abbreviation

08-ACM2-102-m01

### Module coordinator

lecturer of seminar "Anorganische Aspekte der Biochemie und Medizinischen Chemie" (Inorganic Aspects of Biochemistry and Medicinal Chemistry)

### Module offered by

Institute of Inorganic Chemistry

### ECTS

5

### Method of grading

numerical grade

### Only after succ. compl. of module(s)

--

### Duration

1 semester

### Module level

graduate

### Other prerequisites

--

### Contents

This module introduces students to the fundamental principles of bioinorganic chemistry (BIC). It discusses the methods of BIC, structures and effects of metalliferous enzymes and applications of BIC in the fields of diagnosis and therapy.

### Intended learning outcomes

Students are able to describe the principles of, and methods in, BIC. They can explain the structure and effects of metalliferous enzymes and describe applications of BIC in biochemistry and medicine.

### Courses

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### Method of assessment

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<td>1 to 3 written examinations (60 or 90 minutes) or b) oral examination of one candidate each (20 minutes) or c) oral examination in groups (groups of 2, 30 minutes). Should there be the option to choose between several methods of assessment, the module coordinator will choose the method to be used for the module component in the current semester at the beginning of the course.</td>
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### Allocation of places

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### Additional information

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### Referred to in LPO I

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### Contents

This module provides an introduction to solid-state chemistry. It focuses on the structure, chemical and physical properties, synthesis methods and selected materials of solids.

### Intended learning outcomes

Students are able to describe the structure and properties of solids. They can explain methods for solid-state synthesis. They can describe important aspects of selected materials regarding the corresponding solids.

### Courses

(type, number of weekly contact hours, language — if other than German)

S (no information on SWS (weekly contact hours) and course language available)

### Method of assessment

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) 1 to 3 written examinations (60 or 90 minutes) or b) oral examination of one candidate each (20 minutes) or c) oral examination in groups (groups of 2, 30 minutes). Should there be the option to choose between several methods of assessment, the module coordinator will choose the method to be used for the module component in the current semester at the beginning of the course.

Language of assessment: German or English

### Allocation of places

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### Additional information

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### Referred to in LPO I

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**Module coordinator**

lecturer of the seminar "Spezielle Metallorganische Chemie und deren Anwendung in der Homogenkatalyse"

**ECTS**

<table>
<thead>
<tr>
<th>Method of grading</th>
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**Duration**

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<tr>
<th>Module level</th>
<th>Other prerequisites</th>
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<tbody>
<tr>
<td>1 semester</td>
<td>graduate</td>
</tr>
</tbody>
</table>

**Contents**

This module examines elementary organic compounds of transition metals with homogeneous catalytic applications.

**Intended learning outcomes**

Students can describe and analyse the structure, reactivity and analysis of elementary organic compounds. They are able to characterise special substance classes. They can formulate homogeneous catalysis reactions.

**Courses**

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<tr>
<th>(type, number of weekly contact hours, language — if other than German)</th>
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<td>S (no information on SWS (weekly contact hours) and course language available)</td>
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**Method of assessment**

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<th>(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)</th>
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<tbody>
<tr>
<td>a) 1 to 3 written examinations (60 or 90 minutes) or b) oral examination of one candidate each (20 minutes) or c) oral examination in groups (groups of 2, 30 minutes). Should there be the option to choose between several methods of assessment, the module coordinator will choose the method to be used for the module component in the current semester at the beginning of the course. Language of assessment: German or English</td>
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**Allocation of places**

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**Additional information**

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**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

--
Organic Chemistry

(25 ECTS credits)
Compulsory Courses
(15 ECTS credits)
Module title: Modern Synthetic Method
Abbreviation: 08-OCM-SYNT-102-m01
Module coordinator: Lecturer of the seminar
Module offered by: Institute of Organic Chemistry
ECTS: 5
Method of grading: Only after succ. compl. of module(s)
Duration: 1 semester
Module level: Graduate
Other prerequisites: Admission prerequisite to assessment: successful completion of exercises in the respective classes as specified at the beginning of the course (usually 70% of exercises to be successfully completed) as well as regular attendance of exercises (usually a maximum of 2 incidents of unexcused absence).

Contents:
This module discusses modern stereoselective synthesis methods. It focuses on selected total syntheses, organometallic chemistry and catalysis.

Intended learning outcomes:
Students are able to stereoselectively plan complex chemical syntheses and to stereochemically analyse them. They can explain total syntheses. They can describe aspects of organometallic chemistry and catalysis in synthesis chemistry.

Courses:
S + Ü (no information on SWS (weekly contact hours) and course language available)

Method of assessment:
a) 1 to 3 written examinations (60 or 90 minutes) or b) oral examination of one candidate each (20 minutes) or c) oral examination in groups (groups of 2, 30 minutes). Should there be the option to choose between several methods of assessment, the module coordinator will choose the method to be used for the module component in the current semester at the beginning of the course.
Language of assessment: German or English

Allocation of places:
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Additional information:
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Referred to in LPO I (examination regulations for teaching-degree programmes):
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<table>
<thead>
<tr>
<th>Module title</th>
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<tbody>
<tr>
<td>Advanced NMR- and Mass Spectrometry</td>
<td>08-OCM-NMRMS-102-m01</td>
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**Module coordinator**

lab course supervisor

**Module offered by**

Institute of Organic Chemistry

<table>
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</table>

**Duration**

1 semester

**Module level**

graduate

**Other prerequisites**

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### Contents

This module equips students with an advanced knowledge of NMR and mass spectrometry. It offers deeper insights into the theoretical principles of the two measuring techniques and includes exercises that give students the opportunity to learn how to evaluate complicated spectra and use a spectrometer.

**Intended learning outcomes**

Students are able to discuss NMR and mass spectroscopy demonstrating a high degree of expertise in the field. They are able to experiment with both spectrometers and analyse complicated spectra.

**Courses**

(type, number of weekly contact hours, language — if other than German)

P (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) 1 to 3 written examinations (60 or 90 minutes) or b) oral examination of one candidate each (20 minutes) or c) oral examination in groups (groups of 2, 30 minutes)

Language of assessment: German or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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<td>08-OCM-AKP1-102-m01</td>
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<td>graduate</td>
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</table>

**Contents**

This module gives students the opportunity to get involved in the work of one of the research groups based at the Institute of Organic Chemistry and learn some advanced synthesis and analytical methods.

**Intended learning outcomes**

Students are able to describe and use some of the synthesis and analytical methods typically used by the research group as well as to describe theoretical aspects.

**Courses** (type, number of weekly contact hours, language — if other than German)

P (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Talk (approx. 15 minutes) and log (approx. 15 to 20 pages)

Language of assessment: German or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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Compulsory Electives

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<tr>
<td>Modern Aspects of Natural Product Chemistry and Biological Chemistry</td>
<td>08-OCM-NAT-102-m01</td>
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### Module coordinator

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</table>

### Method of grading

- Only after succ. compl. of module(s)

### Duration

1 semester

### Other prerequisites

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### Contents

This module discusses advanced topics in natural product chemistry and biological chemistry.

### Intended learning outcomes

Students are able to discuss advanced topics in natural product chemistry and biological chemistry.

### Courses

- S (no information on SWS (weekly contact hours) and course language available)

### Method of assessment

- a) 1 to 3 written examinations (60 or 90 minutes) or b) oral examination of one candidate each (20 minutes) or c) oral examination in groups (groups of 2, 30 minutes). Should there be the option to choose between several methods of assessment, the module coordinator will choose the method to be used for the module component in the current semester at the beginning of the course.

Language of assessment: German or English

### Allocation of places

- Chemistry Master's: no restrictions. Biochemistry Master's: 20 places. Places will be allocated by lot.

### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

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<td>lecturer of the seminar &quot;Organische Funktionsmaterialien&quot;</td>
<td>Institute of Organic Chemistry</td>
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### Contents

This module discusses advanced topics in organic functional materials. It focuses on basic physical effects, organic solids, the application of organic functional materials as well as organic and metal-organic polymer chemistry.

### Intended learning outcomes

Students are able to explain the basic physical properties of organic functional materials. They are able to name and characterise organic solids and their applications in modern chemistry. Students are able to outline the fundamental principles of organic and metal-organic polymer chemistry and to name polymers of technological importance.

### Courses

(type, number of weekly contact hours, language — if other than German)

S (no information on SWS (weekly contact hours) and course language available)

### Method of assessment

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) 1 to 3 written examinations (60 or 90 minutes) or b) oral examination of one candidate each (20 minutes) or c) oral examination in groups (groups of 2, 30 minutes). Should there be the option to choose between several methods of assessment, the module coordinator will choose the method to be used for the module component in the current semester at the beginning of the course.

Language of assessment: German or English

### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

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<table>
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<td>Organo- and Biocatalysis</td>
<td>08-HKM1-102-m01</td>
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**Module coordinator**

Lecturer of the seminar "Organo- and Biokatalyse"  
Institute of Organic Chemistry

**ECTS**  | **Method of grading**  | **Other prerequisites** |
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**Duration**  | **Module level**  |
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<td>1 semester</td>
<td>graduate</td>
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</table>

**Contents**

This module provides students with deeper insights into topics in organic compounds and enzymes in catalytic processes. Organocatalysis: enantioselective implementation, principles, green chemistry, substance classes and application areas. Biocatalysis: effects of enzymes in view of different aspects, especially regarding organic synthesis.

**Intended learning outcomes**

Students are able to categorise organocatalysts and explain their effects and areas of application. They can describe the structure and applications of enzymes in organic synthesis. They are able to mechanistically describe and analyse the effects of enzymes.

**Courses**

S (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

a) 1 to 3 written examinations (60 or 90 minutes) or b) oral examination of one candidate each (20 minutes) or c) oral examination in groups (groups of 2, 30 minutes). Should there be the option to choose between several methods of assessment, the module coordinator will choose the method to be used for the module component in the current semester at the beginning of the course.

Language of assessment: German or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

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Module title | Supramolecular Chemistry (Basics)
---|---
Abbreviation | 08-SCM1-102-m01

Module coordinator | Module offered by
Lecturer of lecture "Organischen Chemie" | Faculty of Chemistry and Pharmacy

ECTS | Method of grading | Only after succ. compl. of module(s)
---|---|---
5 | numerical grade | --

Duration | Module level | Other prerequisites
---|---|---
1 semester | graduate | --

Contents
This module introduces students to the fundamental principles of supramolecular chemistry. It focuses on interactions between molecules, molecular recognition by receptors, complexes, supramolecular polymers, coordination polymers and networks, liquid crystals, self-assembly in aqueous media, synthetic ion channels and modern applications of supramolecular chemistry.

Intended learning outcomes
Students are able to explain interactions between molecules demonstrating a high degree of expertise in the field as well as to describe the formation, structure and polymers of coordination compounds. They are able to describe the self-assembly of polymers in aqueous media as well as to identify the characteristics of synthetic ion channels. They can name modern applications of supramolecular chemistry.

Courses
S (no information on SWS (weekly contact hours) and course language available)

Method of assessment
written examination (approx. 90 minutes) or oral examination of one candidate each (approx. 20 minutes)
Language of assessment: German or English

Allocation of places
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Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
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<table>
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<td>lecturer of lecture &quot;Bioorganische Chemie&quot; (Bioorganic Chemistry)</td>
<td>Institute of Organic Chemistry</td>
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</table>

**Contents**

This module discusses topics at the interface of organic chemistry, biology and medicine. It focuses on molecular interactions and recognition, molecular diversity, active agent development, new aspects of DNA, RNA, proteins and carbohydrates.

**Intended learning outcomes**

Students are able to describe molecular interactions and detection mechanisms of bioorganic chemistry. They can explain the molecular diversity of biological systems. They can characterise the fabrication of agents. They can describe modern aspects of DNA, RNA, proteins and carbohydrates.

**Courses**

(type, number of weekly contact hours, language — if other than German)

S (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) 1 to 3 written examinations (60 or 90 minutes) or b) oral examination of one candidate each (20 minutes) or c) oral examination in groups (groups of 2, 30 minutes). Should there be the option to choose between several methods of assessment, the module coordinator will choose the method to be used for the module component in the current semester at the beginning of the course.

Language of assessment: German or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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<td>Computational Chemistry</td>
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<tr>
<td>lecturer of lecture &quot;Computational Chemistry&quot;</td>
<td>Institute of Physical and Theoretical Chemistry</td>
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<td>Admission prerequisite to assessment: successful completion of exercises in the respective classes as specified at the beginning of the course (usually 70% of exercises to be successfully completed) as well as regular attendance of exercises (usually a maximum of 2 incidents of unexcused absence).</td>
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</table>

**Contents**

The module introduces students to computational chemistry.

**Intended learning outcomes**

Students are able to explain the theoretical principles of computational chemistry and to apply methods in computational chemistry.

**Courses** (type, number of weekly contact hours, language — if other than German)

S + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (90 minutes)

Language of assessment: German or English

**Allocation of places**

--

**Additional information**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--
Physical Chemistry
(25 ECTS credits)
Compulsory Courses

(10 ECTS credits)
Module title: Advanced Physical Chemistry  
Abbreviation: 08-PCM1-102-m01

Module coordinator: Lecturer of seminar "Laserspektroskopie" (Laser Spectroscopy)  
Module offered by: Institute of Physical and Theoretical Chemistry

ECTS: 10  
Method of grading: Only after succ. compl. of module(s)

Duration: 1 semester  
Module level: Graduate  
Other prerequisites: --

Contents: This module introduces students to the fundamental principles of laser spectroscopy. It discusses absorption and emission spectroscopy. In addition, the module gives students the opportunity to use modern experimental methods in physical chemistry in the laboratory. After a safety briefing, the students autonomously conduct experiments in the laboratory. Students will be expected to take tests and write lab reports to demonstrate their knowledge.

Intended learning outcomes: Students are able to explain the components and operating principles of lasers as well as the optical principles of laser technology. They are able to describe the principles of absorption and emission spectroscopy. Students have developed a high level of proficiency in modern experimental methods in physical chemistry. They are able to analyse the resulting measurements and write a lab report.

Courses: This module comprises 2 module components. Information on courses will be listed separately for each module component.

- 08-PCM1-1-102: S + Ü (no information on SWS (weekly contact hours) and course language available)
- 08-PCM1-2-102: P (no information on SWS (weekly contact hours) and course language available)

Method of assessment: Assessment in this module comprises the assessments in the individual module components as specified below. Unless stated otherwise, successful completion of the module will require successful completion of all individual assessments.

- Assessment in module component 08-PCM1-1-102: Laser Spectroscopy Laser Spectroscopy
  - 5 ECTS, Method of grading: numerical grade
  - Written examination (90 minutes) or oral examination (20 minutes)
  - Language of assessment: German or English

- Assessment in module component 08-PCM1-2-102: Advanced Physical Chemistry (Lab)
  - 5 ECTS, Method of grading: (not) successfully completed
  - Vortestate (pre-experiment exams) and Nachtestate (post-experiment exams) (approx. 15 minutes), log (approx. 15 pages)
  - Language of assessment: German or English

Allocation of places: --

Additional information: --

Referred to in LPO I (examination regulations for teaching-degree programmes): --
Compulsory Electives

(15 ECTS credits)
### Computational Chemistry

**Abbreviation**

08-TCM2-102-m01

**Module coordinator**

Lecturer of lecture "Computational Chemistry"

**Module offered by**

Institute of Physical and Theoretical Chemistry

**ECTS**

5

**Method of grading**

Numerical grade

**Duration**

1 semester

**Module level**

Graduate

**Other prerequisites**

Admission prerequisite to assessment: successful completion of exercises in the respective classes as specified at the beginning of the course (usually 70% of exercises to be successfully completed) as well as regular attendance of exercises (usually a maximum of 2 incidents of unexcused absence).

**Contents**

The module introduces students to computational chemistry.

**Intended learning outcomes**

Students are able to explain the theoretical principles of computational chemistry and to apply methods in computational chemistry.

**Courses**

(S + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

Written examination (90 minutes)

Language of assessment: German or English

**Allocation of places**

--

**Additional information**

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**Referred to in LPO**

(examination regulations for teaching-degree programmes)
### Module title
Chemical Dynamics

### Abbreviation
08-PCM2-102-m01

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</table>

### Contents
This module gives students the opportunity to explore advanced topics in chemical kinetics and reaction dynamics in more detail. It discusses methods and models for investigating and describing chemical reactions.

### Intended learning outcomes
Students are able to discuss advanced topics in chemical kinetics and reaction dynamics. They can describe methods and models for the investigation of chemical reactions.

### Courses
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### Allocation of places
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### Additional information
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### Referred to in LPO I
(examination regulations for teaching-degree programmes)

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<td>lecturer of the seminar &quot;Nanoskalige Materialien&quot;</td>
<td>Institute of Physical and Theoretical Chemistry</td>
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<td>1 semester</td>
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</table>

**Contents**

This module discusses advanced topics in nanoscale materials. It focuses on the structure, properties, fabrication, modern characterisation methods and application areas of nanoscale materials.

**Intended learning outcomes**

Students are able to characterise nanoscale materials. They are able to name analytical methods and application areas of nanoscale materials.

**Courses**

(type, number of weekly contact hours, language — if other than German)

S + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (90 minutes) or oral examination of one candidate each (20 minutes) or talk (30 minutes)

Language of assessment: German or English

**Allocation of places**

--

**Additional information**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--
### Module title
Ultrafast spectroscopy and quantum-control

### Abbreviation
08-PCM4-102-m01

### Module coordinator
Lecturer of the seminar "Ultrakurzzeitspektroskopie and Quantenkontrolle"

### Module offered by
Institute of Physical and Theoretical Chemistry

### ECTS
5

### Method of grading
Numerical grade

### Only after succ. compl. of module(s)
--

### Duration
1 semester

### Module level
Graduate

### Other prerequisites
--

### Contents
This module discusses advanced topics in ultrafast spectroscopy and quantum control. It focuses on ultrashort laser pulses, time-resolved laser spectroscopy and coherent control.

### Intended learning outcomes
Students are able to describe the generation of ultrashort laser pulses and to characterise them. They can explain the theory of time-resolved laser spectroscopy and name experimental methods. They can describe the principles and applications of quantum control.

### Courses
S + Ü (no information on SWS (weekly contact hours) and course language available)

### Method of assessment
Written examination (90 minutes) or oral examination of one candidate each (20 minutes) or talk (30 minutes)

Language of assessment: German or English

### Allocation of places
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### Additional information
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### Referred to in LPO I
(examination regulations for teaching-degree programmes)

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<table>
<thead>
<tr>
<th>Module title</th>
<th>Abbreviation</th>
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<tbody>
<tr>
<td>Physical chemistry of supramolecular assemblies</td>
<td>08-PCM5-102-m01</td>
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<tr>
<td>lecturer of the seminar &quot;Physikalische Chemie Supramolekularer Strukturen&quot;</td>
<td>Institute of Physical and Theoretical Chemistry</td>
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<tbody>
<tr>
<td>1 semester</td>
<td>graduate</td>
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</table>

**Contents**

This module examines the basic interactions between molecules. It discusses the formation and physical-chemical properties of aggregates as well as key applications of supramolecular chemistry.

**Intended learning outcomes**

Students are able to explain the basic interactions between molecules demonstrating a high degree of expertise in the field. They can describe the formation and physical-chemical properties of aggregates. They can name modern applications of supramolecular chemistry.

**Courses**

<table>
<thead>
<tr>
<th>Type</th>
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<th>Language</th>
<th>Notes</th>
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**Method of assessment**

- written examination (90 minutes) and/or oral examination of one candidate each (20 minutes) and/or talk (30 minutes)
- Language of assessment: German or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I**

( examination regulations for teaching-degree programmes)

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<table>
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<th>Module title</th>
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<tr>
<td>Physical Chemistry (Advanced Lab)</td>
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<td>graduate</td>
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</table>

**Contents**

This module gives students the opportunity to get involved in the work of one of the research groups based at the Institute of Physical Chemistry and learn some advanced synthesis and analytical methods.

**Intended learning outcomes**

Students have become proficient in the research methods typically used by the relevant physical chemistry research group. They are able to analyse their findings and thus help answer topical questions in physical chemistry.

**Courses** (type, number of weekly contact hours, language — if other than German)

P (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

presentation (20 minutes)
Language of assessment: German or English

**Allocation of places**

--

**Additional information**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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Module title | Abbreviation
---|---
Theoretical Chemistry | 08-TCM1-102-m01

Module coordinator | Module offered by
lecturer of lecture "Theoretische Chemie" | Institute of Physical and Theoretical Chemistry

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<td>Admission prerequisite to assessment: successful completion of exercises in the respective classes as specified at the beginning of the course (usually 70% of exercises to be successfully completed) as well as regular attendance of exercises (usually a maximum of 2 incidents of unexcused absence).</td>
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Contents
The module introduces students to theoretical chemistry.

Intended learning outcomes
Students are able to describe the mathematical and physical principles underlying the quantum chemical and quantum dynamical approaches of theoretical chemistry.

Courses (type, number of weekly contact hours, language — if other than German)
S + Ü (no information on SWS (weekly contact hours) and course language available)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
written examination (90 minutes)
Language of assessment: German or English

Allocation of places
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Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
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Biochemistry
(25 ECTS credits)
Compulsory Courses

(10 ECTS credits)
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<thead>
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<td>Molecular Biology</td>
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**Module coordinator**

holder of the Chair of Biochemistry

**Module offered by**

Chair of Biochemistry

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</table>

**Duration**

1 semester

**Module level**

undergraduate

**Other prerequisites**

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**Contents**

The module covers specific topics of molecular physiology and functional biochemistry in lectures and exercises.

**Intended learning outcomes**

Students have developed a sound knowledge of molecular biology.

**Courses**

Ü + V (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

1 written examination (90 minutes) or 2 written examinations (60 to 90 minutes)

Language of assessment: German or English

**Allocation of places**

--

**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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### Module title
Molecular Biology Practical Course

### Abbreviation
08-BC-MOLP-102-m01

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<tbody>
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</table>

### Contents
The module provides practical skills in the fields of recombinant engineering and characterization of macromolecular complexes, current biomolecular techniques, analysis of biochemical processes in vivo, and up-to-date imaging techniques.

### Intended learning outcomes
The student has knowledge of molecular biology and is able to apply the contents in practical experiments.

### Courses

#### P
(no information on SWS (weekly contact hours) and course language available)

### Method of assessment

**pre/post-experiment examination talks (Vor-/Nachtestate, approx. 15 minutes), log (approx. 5 to 10 pages)**  
Language of assessment: German or English

### Allocation of places
Number of places: 12. Should the number of applications exceed the number of available places, places will be allocated in a standardised procedure among all applicants irrespective of their subjects according to the following quotas:  
Quota 1 (80% of places): grade achieved in module 08-BC; among applicants with the same grade, places will be allocated by lot.  
Quota 2 (20% of places): number of subject semesters of the respective applicant; among applicants with the same number of subject semesters, places will be allocated by lot. A waiting list will be maintained and places re-allocated as they become available.

### Additional information

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### Referred to in LPO 1
(examination regulations for teaching-degree programmes)

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Compulsory Electives
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<tr>
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<td>Admission prerequisite to assessment: successful completion of exercises in the respective classes as specified at the beginning of the course (usually 70% of exercises to be successfully completed) as well as regular attendance of exercises (usually a maximum of 2 incidents of unexcused absence).</td>
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</tbody>
</table>

**Contents**

The module imparts the basic knowledge of biochemistry by lectures and in-depth tutorials.

**Intended learning outcomes**

Students have become familiar with the fundamental principles of biochemistry. They are able to describe the key biochemical processes in cellular systems.

**Courses** (type, number of weekly contact hours, language — if other than German)

- V + Ü + V + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

- a) 1 to 3 written examinations (1 written examination: approx. 90 minutes; 2 written examinations: approx. 60 or 90 minutes each; 3 written examinations: approx. 60 minutes each) or b) oral examination of one candidate each (approx. 20 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes)

**Allocation of places**

- --

**Additional information**

- --

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

- --
Module title
Biochemistry Lab

Abbreviation
08-BCP-092-m01

Module coordinator
holder of the Chair of Biochemistry

Module offered by
Chair of Biochemistry

ECTS
5

Method of grading
Only after succ. compl. of module(s)

Duration
1 semester

Module level
undergraduate

Other prerequisites
--

Contents
In this module the basics of scientific biochemical experimentation shall be practiced in practical exercises.

Intended learning outcomes
After participating in the practical exercises the students master basic biochemical methods and are able to purposefully apply them.

Courses
P (no information on SWS (weekly contact hours) and course language available)

Method of assessment
pre/post-experiment examination talks (Vortestate and Nachtestate, approx. 15 minutes each), practical work (log, approx. 5 to 10 pages)
Assessment offered: once a year, summer semester

Allocation of places
Number of places: 24. Should the number of applications exceed the number of available places, places will be allocated in a standardised procedure among all applicants irrespective of their subjects according to the following quotas: Quota 1 (80% of places): grade achieved in module 08-BC; among applicants with the same grade, places will be allocated by lot. Quota 2 (20% of places): number of subject semesters of the respective applicant; among applicants with the same number of subject semesters, places will be allocated by lot. A waiting list will be maintained and places re-allocated as they become available.

Additional information
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Referred to in LPO 1 (examination regulations for teaching-degree programmes)
--
### Module title

| Bioinorganic Chemistry | 08-ACM2-102-m01 |

### Module coordinator

| Abbreviation | Institute of Inorganic Chemistry |

| Lecturer of seminar "Anorganische Aspekte der Biochemie and Medizinischen Chemie" (Inorganic Aspects of Biochemistry and Medicinal Chemistry) |

### ECTS

| 5 | numerical grade |

### Method of grading

| Only after succ. compl. of module(s) |

### Duration

| 1 semester | graduate |

### Other prerequisites

| --- |

### Contents

This module introduces students to the fundamental principles of bioinorganic chemistry (BIC). It discusses the methods of BIC, structures and effects of metalliferous enzymes and applications of BIC in the fields of diagnosis and therapy.

### Intended learning outcomes

Students are able to describe the principles of, and methods in, BIC. They can explain the structure and effects of metalliferous enzymes and describe applications of BIC in biochemistry and medicine.

### Courses

| (type, number of weekly contact hours, language — if other than German) |

| S (no information on SWS (weekly contact hours) and course language available) |

### Method of assessment

| (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus) |

| a) 1 to 3 written examinations (60 or 90 minutes) or b) oral examination of one candidate each (20 minutes) or c) oral examination in groups (groups of 2, 30 minutes). Should there be the option to choose between several methods of assessment, the module coordinator will choose the method to be used for the module component in the current semester at the beginning of the course. Language of assessment: German or English |

### Allocation of places

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### Additional information

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### Referred to in LPO I (examination regulations for teaching-degree programmes)

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### Module Catalogue for the Subject Chemistry

**Master's with 1 major, 120 ECTS credits**

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<tr>
<th>Module title</th>
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<tbody>
<tr>
<td>Modern Aspects of Natural Product Chemistry and Biological Chemistry</td>
<td>08-OCM-NAT-102-m01</td>
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<td>Institute of Organic Chemistry</td>
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<th>Module level</th>
<th>Other prerequisites</th>
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<tbody>
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</table>

### Contents

This module discusses advanced topics in natural product chemistry and biological chemistry.

### Intended learning outcomes

Students are able to discuss advanced topics in natural product chemistry and biological chemistry.

### Courses

(S type, number of weekly contact hours, language — if other than German)

S (no information on SWS (weekly contact hours) and course language available)

### Method of assessment

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) 1 to 3 written examinations (60 or 90 minutes) or b) oral examination of one candidate each (20 minutes) or c) oral examination in groups (groups of 2, 30 minutes). Should there be the option to choose between several methods of assessment, the module coordinator will choose the method to be used for the module component in the current semester at the beginning of the course.

Language of assessment: German or English

### Allocation of places

Chemistry Master's: no restrictions. Biochemistry Master's: 20 places. Places will be allocated by lot.

### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

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<table>
<thead>
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<td>Organo- and Biocatalysis</td>
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<td>Institute of Organic Chemistry</td>
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<td>1 semester</td>
<td>graduate</td>
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</table>

### Contents

This module provides students with deeper insights into topics in organic compounds and enzymes in catalytic processes. Organocatalysis: enantioselective implementation, principles, green chemistry, substance classes and application areas. Biocatalysis: effects of enzymes in view of different aspects, especially regarding organic synthesis.

### Intended learning outcomes

Students are able to categorise organocatalysts and explain their effects and areas of application. They can describe the structure and applications of enzymes in organic synthesis. They are able to mechanistically describe and analyse the effects of enzymes.

### Courses

(type, number of weekly contact hours, language — if other than German)

S (no information on SWS (weekly contact hours) and course language available)

### Method of assessment

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) 1 to 3 written examinations (60 or 90 minutes) or b) oral examination of one candidate each (20 minutes) or c) oral examination in groups (groups of 2, 30 minutes). Should there be the option to choose between several methods of assessment, the module coordinator will choose the method to be used for the module component in the current semester at the beginning of the course.

Language of assessment: German or English

### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

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## Module Catalogue for the Subject Chemistry

### Master's with 1 major, 120 ECTS credits

<table>
<thead>
<tr>
<th>Module title</th>
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<tbody>
<tr>
<td>Practical course &quot;Molecular Machines&quot; for advanced students</td>
<td>08-BC-VPMM-102-m01</td>
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### Module coordinator
holder of the Chair of Biochemistry

### Module offered by
Chair of Biochemistry

### ECTS
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<tr>
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</table>

### Duration
1 semester

### Module level
graduate

### Other prerequisites
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### Contents
This module gives students the opportunity to explore a research topic. Selected methods and topics in molecular biology and biochemistry; cloning, mutagenesis, protein expression and purification, RNA-protein and protein-protein interactions, isolation and functional analysis of macromolecular complexes.

### Intended learning outcomes
The student is able to deeply acquaint himself/herself with a specific research topic, and to present the results in a talk.

### Courses
P (no information on SWS (weekly contact hours) and course language available)

### Method of assessment
log (approx. 20 pages) and talk (approx. 15 minutes)

Language of assessment: German or English

### Allocation of places
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### Additional information
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### Referred to in LPO I
(examination regulations for teaching-degree programmes)

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<table>
<thead>
<tr>
<th>Module title</th>
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<tbody>
<tr>
<td>Practical course &quot;Protein Degradation in Eukaryotes&quot; for advanced students</td>
<td>08-BC-VPPD-102-m01</td>
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<tbody>
<tr>
<td>1 semester</td>
<td>graduate</td>
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</table>

**Contents**

This module gives students the opportunity to explore a research topic in the field of protein degradation in eukaryotes.

**Intended learning outcomes**

The student is able to deeply acquaint himself/herself with a specific research topic, and to present the results in a talk.

**Courses**

(type, number of weekly contact hours, language — if other than German)

P (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

log (approx. 20 pages) and talk (approx. 15 minutes)

Language of assessment: German or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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<table>
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<tr>
<td>Practical course &quot;RNA Biochemistry&quot; for advanced students</td>
<td>08-BC-VPRB-102-m01</td>
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**Contents**

This module gives students the opportunity to explore a research topic in the field of RNA biochemistry. Ribosomes as "molecular machines", regulatory mechanisms of eukaryotic protein biosynthesis. Gradient centrifugation, in vitro translation in different cell-free systems.

**Intended learning outcomes**

Students are able to explore a specific research topic and deliver an oral presentation on the results of their work. They are able to familiarise themselves with different mechanisms of general and specific translation control with the help of different methods as well as to present their findings in an appropriate and understandable manner.

**Courses** (type, number of weekly contact hours, language — if other than German)

P (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

log (approx. 20 pages) and talk (approx. 15 minutes)
Language of assessment: German or English

**Allocation of places**

--

**Additional information**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--
### Module title
Practical course "Structural Biology" for advanced

| Abbreviation       | 08-BC-VPSB-102-m01 |

### Module coordinator
holder of the Chair of Biochemistry

### Module offered by
Chair of Biochemistry

### ECTS
10

### Method of grading
numerical grade

### Only after succ. compl. of module(s)
--

### Duration
1 semester

### Module level
graduate

### Other prerequisites
--

### Contents
This module discusses cloning and the expression of protein constructs for crystallisation. It teaches students the fundamental principles and techniques of crystallisation and crystal optimisation as well as crystallographic data collection.

### Intended learning outcomes
Students have developed an understanding of the method of selecting protein constructs for crystallisation. They master fundamental skills and techniques for protein crystallisation as well as data collection and processing.

### Courses
P (no information on SWS (weekly contact hours) and course language available)

### Method of assessment
log (approx. 20 pages) and talk (approx. 15 minutes)
Language of assessment: German or English

### Allocation of places
--

### Additional information
--

### Referred to in LPO I
(examination regulations for teaching-degree programmes)
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<thead>
<tr>
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<th>Abbreviation</th>
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<td>Principles of drug design</td>
<td>08-MCM3-102-m01</td>
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<td>1 semester</td>
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**Contents**

Fundamentals: drug targets (types and classification), target validation, effect mechanisms, protein-ligand interactions, lead finding; lead optimisation. Experimental methods: bioassays, HTS, combinatorial chemistry, naturally occurring substances. Theoretical methods: molecular modelling, structure-based drug design, pharmacophore models, docking, virtual screening, simulation methods, de novo design. Ligand-based drug design. QSAR. Predictions of pharmacokinetic and toxicological components (ADME). Case examples, prodrug strategies, bioisosterism, SAR.

**Intended learning outcomes**

The student masters theoretical and experimental methods and aspects of drug design.

**Courses**

S + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

presentation with discussion (approx. 30 minutes)

Language of assessment: German or English

**Allocation of places**

Chemistry Master’s and Mathematics Master’s: no restrictions. Biochemistry Master’s: 10 places. Places will be allocated by lot.

**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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<table>
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**Contents**

This module covers specific topics of clinical analytical chemistry.

**Intended learning outcomes**

Students have developed an advanced knowledge of molecular biology.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (120 minutes)

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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**Contents**

This module covers practical topics in clinical chemistry and clinical diagnostics as well as the related analytical methods.

**Intended learning outcomes**

Students have developed a knowledge of clinical analytical chemistry and are able to apply it to practical experiments.

**Courses** (type, number of weekly contact hours, language — if other than German)

P (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

examination talks (Testate, approx. 15 minutes each), log (approx. 5 to 10 pages)

**Allocation of places**

--

**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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Functional Materials
(25 ECTS credits)
Compulsory Courses

(20 ECTS credits)
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<tr>
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<td>Materials Science 1 (Basic Introduction)</td>
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<td>Dean of Studies Funktionswerkstoffe (Functional Materials)</td>
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</table>

Contents
This module discusses the fundamental relations between chemical bonding, the structure, the microstructure and the properties of materials.

Intended learning outcomes
Students have become familiar with the fundamental relations between chemical bonding, the structure, the microstructure and the properties of materials. They have developed the ability to apply them to research problems.

Courses
V + Ü (no information on SWS (weekly contact hours) and course language available)

Method of assessment
written examination (90 minutes)

Allocation of places
--

Additional information
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Referred to in LPO I
(examination regulations for teaching-degree programmes)

--
## Module Catalogue for the Subject Chemistry

Master's with 1 major, 120 ECTS credits

### Module: Organic Functional Materials

<table>
<thead>
<tr>
<th>Module title</th>
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</table>

### Contents

This module discusses advanced topics in organic functional materials. It focuses on basic physical effects, organic solids, the application of organic functional materials as well as organic and metal-organic polymer chemistry.

### Intended learning outcomes

Students are able to explain the basic physical properties of organic functional materials. They are able to name and characterise organic solids and their applications in modern chemistry. Students are able to outline the fundamental principles of organic and metal-organic polymer chemistry and to name polymers of technological importance.

### Courses

<table>
<thead>
<tr>
<th>Type</th>
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### Method of assessment

- a) 1 to 3 written examinations (60 or 90 minutes) or
- b) oral examination of one candidate each (20 minutes) or
- c) oral examination in groups (groups of 2, 30 minutes).

Should there be the option to choose between several methods of assessment, the module coordinator will choose the method to be used for the module component in the current semester at the beginning of the course.

Language of assessment: German or English

### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

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<table>
<thead>
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<td>lecturer specialisation subject Funktionsmaterialien (Functional Materials)</td>
<td>Chair of Chemical Technology of Material Synthesis</td>
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**Contents**

Ten selected experiments in materials science.

**Intended learning outcomes**

Students have developed an advanced proficiency in the performance of experiments in materials science.

**Courses** (type, number of weekly contact hours, language — if other than German)

P (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Vortestate (pre-experiment exams) and Nachtestate (post-experiment exams) (15 minutes), assessment of practical performance, log (5 to 10 pages)

Language of assessment: German or English

**Allocation of places**

--

**Additional information**

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**Referred to in LPO 1** (examination regulations for teaching-degree programmes)

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<table>
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<tr>
<th>Module title</th>
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<td>Project Work</td>
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<tbody>
<tr>
<td>head of the research group offering the module</td>
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<td>graduate</td>
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</table>

**Contents**

This module gives students the opportunity to explore a research topic under the guidance of a supervisor and to describe their findings.

**Intended learning outcomes**

Students have developed an advanced proficiency in the performance of experiments in materials science.

**Courses**

P (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

Talk (approx. 15 minutes) and log (approx. 15 pages)

Language of assessment: German or English

**Allocation of places**

--

**Additional information**

--

**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

--
Compulsory Electives

(5 ECTS credits)
Module title
Chemically and biologically inspired Nanotechnology for Materials Synthesis

Abbreviation
08-NT-101-m01

Module coordinator
holder of the Chair of Chemical Technology of Material Synthesis

Module offered by
Chair of Chemical Technology of Material Synthesis

ECTS
5

Method of grading
numerical grade

Only after succ. compl. of module(s)
--

Duration
1 semester

Module level
undergraduate

Other prerequisites
--

Contents
This module provides an introduction to the synthesis methods of sol-gel chemistry and discusses the methods of analysis used to characterise the generated materials. It also discusses the fundamental principles of biomineralisation and uses examples to introduce students to bio-inspired material synthesis.

Intended learning outcomes
Students have developed an advanced knowledge of sol-gel chemistry and biomineralisation.

Courses (type, number of weekly contact hours, language — if other than German)
This module comprises 2 module components. Information on courses will be listed separately for each module component.

• 08-NT-1-101: V (no information on SWS (weekly contact hours) and course language available)
• 08-NT-2-101: V (no information on SWS (weekly contact hours) and course language available)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
Assessment in this module comprises the assessments in the individual module components as specified below. Unless stated otherwise, successful completion of the module will require successful completion of all individual assessments.

Assessment in module component 08-NT-1-101: Chemically and biologically inspired Nanotechnology for Materials Synthesis
• 2 ECTS, Method of grading: numerical grade
• oral examination (approx. 15 minutes)

Assessment in module component 08-NT-2-101: From Biomineralisation to biologically inspired Materials Synthesis
• 3 ECTS, Method of grading: numerical grade
• oral examination (approx. 20 minutes)

Allocation of places
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Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
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<td>Materials Science 2 (The Major Material Groups)</td>
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</table>

### Contents

This module deals with production and properties of the most important materials groups.

### Intended learning outcomes

The students possess comprehensive knowledge about fabrication and properties of the major classes of materials and are able to apply this to scientific problems.

### Courses

(V + Ü (no information on SWS (weekly contact hours) and course language available)

### Method of assessment

written examination (approx. 90 minutes)

### Allocation of places

--

### Additional information

--

### Referred to in LPO I

(examination regulations for teaching-degree programmes)
### Module title
Solid state chemistry and inorganic materials

### Abbreviation
08-ACM3-102-m01

### Module coordinator
lecturer of seminar "Festkörperchemie and Anorganische Materialien" (Solid State Chemistry and Inorganic Materials)

### Module offered by
Institute of Inorganic Chemistry

### ECTS
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### Contents
This module provides an introduction to solid-state chemistry. It focuses on the structure, chemical and physical properties, synthesis methods and selected materials of solids.

### Intended learning outcomes
Students are able to describe the structure and properties of solids. They can explain methods for solid-state synthesis. They can describe important aspects of selected materials regarding the corresponding solids.

### Courses
(type, number of weekly contact hours, language — if other than German)
S (no information on SWS (weekly contact hours) and course language available)

### Method of assessment
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
a) 1 to 3 written examinations (60 or 90 minutes) or b) oral examination of one candidate each (20 minutes) or c) oral examination in groups (groups of 2, 30 minutes). Should there be the option to choose between several methods of assessment, the module coordinator will choose the method to be used for the module component in the current semester at the beginning of the course.
Language of assessment: German or English

### Allocation of places
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### Additional information
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### Referred to in LPO I
(examination regulations for teaching-degree programmes)
--
## Module title
Supramolecular Chemistry (Basics)

| Abbreviation | 08-SCM1-102-m01 |

### Module coordinator
lecturer of lecture "Organischen Chemie"

### Module offered by
Faculty of Chemistry and Pharmacy

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### Method of grading
Only after succ. compl. of module(s)

### ECTS
5

### Method of grading
Only after succ. compl. of module(s)

### Duration
1 semester

### Module level
graduate

### Other prerequisites
--

### Contents
This module introduces students to the fundamental principles of supramolecular chemistry. It focuses on interactions between molecules, molecular recognition by receptors, complexes, supramolecular polymers, coordination polymers and networks, liquid crystals, self-assembly in aqueous media, synthetic ion channels and modern applications of supramolecular chemistry.

### Intended learning outcomes
Students are able to explain interactions between molecules demonstrating a high degree of expertise in the field as well as to describe the formation, structure and polymers of coordination compounds. They are able to describe the self-assembly of polymers in aqueous media as well as to identify the characteristics of synthetic ion channels. They can name modern applications of supramolecular chemistry.

### Courses
S (no information on SWS (weekly contact hours) and course language available)

### Method of assessment
written examination (approx. 90 minutes) or oral examination of one candidate each (approx. 20 minutes)

Language of assessment: German or English

### Allocation of places
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### Additional information
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### Referred to in LPO I
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<td>Institute of Physical and Theoretical Chemistry</td>
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**Contents**

This module discusses advanced topics in nanoscale materials. It focuses on the structure, properties, fabrication, modern characterisation methods and application areas of nanoscale materials.

**Intended learning outcomes**

Students are able to characterise nanoscale materials. They are able to name analytical methods and application areas of nanoscale materials.

**Courses**

S + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

Written examination (90 minutes) or oral examination of one candidate each (20 minutes) or talk (30 minutes)

Language of assessment: German or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I**

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<table>
<thead>
<tr>
<th>Module coordinator</th>
<th>Module offered by</th>
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<tbody>
<tr>
<td>Dean of Studies Funktionswerkstoffe (Functional Materials)</td>
<td>Chair of Chemical Technology of Material Synthesis</td>
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<th>Module level</th>
<th>Other prerequisites</th>
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<tbody>
<tr>
<td>1 semester</td>
<td>graduate</td>
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</table>

**Contents**

The module imparts the theoretical fundamentals of molecular and soft materials.

**Intended learning outcomes**

Students have developed a knowledge of the principles of molecular and soft materials and are able to apply that knowledge to research problems.

**Courses**

V + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

Presentation (approx. 30 minutes) and a) 1 to 3 written examinations (1 written examination: 90 minutes; 2 written examinations: 60 or 90 minutes each; 3 written examinations: 60 minutes each) or b) oral examination of one candidate each (approx. 20 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes)

**Allocation of places**

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**Additional information**

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**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

--
Homogeneous Catalysis

(25 ECTS credits)
Compulsory Courses
(20 ECTS credits)
Module title |
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<tbody>
<tr>
<td>Advanced organometallic chemistry and its application in homogeneous catalysis</td>
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Abbreviation |
| 08-HKM2-102-m01 |

Module coordinator |
| lecturer of the seminar "Spezielle Metallorganische Chemie und deren Anwendung in der Homogenkatalyse" |

Module offered by |
| Institute of Inorganic Chemistry |

ECTS |
| 5 |

Method of grading |
| Only after succ. compl. of module(s) |

Numerical grade |
| -- |

Duration |
| 1 semester |

Module level |
| graduate |

Other prerequisites |
| -- |

Contents
This module examines elementary organic compounds of transition metals with homogeneous catalytic applications.

Intended learning outcomes
Students can describe and analyse the structure, reactivity and analysis of elementary organic compounds. They are able to characterise special substance classes. They can formulate homogeneous catalysis reactions.

Courses
(type, number of weekly contact hours, language — if other than German)
| S (no information on SWS (weekly contact hours) and course language available) |

Method of assessment
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
a) 1 to 3 written examinations (60 or 90 minutes) or b) oral examination of one candidate each (20 minutes) or c) oral examination in groups (groups of 2, 30 minutes). Should there be the option to choose between several methods of assessment, the module coordinator will choose the method to be used for the module component in the current semester at the beginning of the course.
Language of assessment: German or English

Allocation of places |
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Additional information |
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Referred to in LPO I (examination regulations for teaching-degree programmes)
| -- |
## Module title

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<th>Module title</th>
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<tbody>
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<td>Organo- and Biocatalysis</td>
<td>08-HKM1-102-m01</td>
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## Module coordinator

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<tr>
<td>1 semester</td>
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</table>

## Contents

This module provides students with deeper insights into topics in organic compounds and enzymes in catalytic processes. Organocatalysis: enantioselective implementation, principles, green chemistry, substance classes and application areas. Biocatalysis: effects of enzymes in view of different aspects, especially regarding organic synthesis.

## Intended learning outcomes

Students are able to categorise organocatalysts and explain their effects and areas of application. They can describe the structure and applications of enzymes in organic synthesis. They are able to mechanistically describe and analyse the effects of enzymes.

## Courses

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<tr>
<th>Type</th>
<th>Number of weekly contact hours</th>
<th>Language</th>
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<tr>
<td>S</td>
<td>no information on SWS</td>
<td>German or English</td>
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</table>

## Method of assessment

- a) 1 to 3 written examinations (60 or 90 minutes) or
- b) oral examination of one candidate each (20 minutes) or
- c) oral examination in groups (groups of 2, 30 minutes).

Should there be the option to choose between several methods of assessment, the module coordinator will choose the method to be used for the module component in the current semester at the beginning of the course.

Language of assessment: German or English

## Allocation of places

--

## Additional information

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## Referred to in LPO I

(examination regulations for teaching-degree programmes)

--
## Module title

**Practical course "Homogeneous catalysis"**

**Abbreviation**  
08-HKM3-102-m01

### Module coordinator

Lecturer of the seminar "Spezielle Metallorganische Chemie und deren Anwendung in der Homogenkatalyse"

### Module offered by

Faculty of Chemistry and Pharmacy

### ECTS

10

### Method of grading

Only after succ. compl. of module(s)

### Only after succ. compl. of module(s)

10 (not) successfully completed

### Duration

1 semester

### Module level

Graduate

### Other prerequisites

--

### Contents

This module gives students the opportunity to enhance their skills in advanced synthesis and analytical methods in homogeneous catalysis. The focus will be on catalyst synthesis and characterisation, spectral analysis and crystallography. Students will be expected to conduct their work in the lab independently, write a lab report documenting their findings and deliver a presentation.

### Intended learning outcomes

Students are able to use advanced synthesis and analytical methods in homogeneous catalysis in the lab and to interpret their findings. They are able to write a lab report documenting their findings and deliver a presentation.

### Courses

P + P (no information on SWS (weekly contact hours) and course language available)

### Method of assessment

Practical work with lab report (approx. 10 pages) and talk (approx. 15 minutes)  
Language of assessment: German or English

### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

--
Compulsory Electives

(5 ECTS credits)
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<td>Modern Synthetic Method</td>
<td>08-OCM-SYNT-102-m01</td>
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<tbody>
<tr>
<td>lecturer of the seminar</td>
<td>Institute of Organic Chemistry</td>
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<th>Duration</th>
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<th>Other prerequisites</th>
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<tbody>
<tr>
<td>1 semester</td>
<td>graduate</td>
<td>Admission prerequisite to assessment: successful completion of exercises in the respective classes as specified at the beginning of the course (usually 70% of exercises to be successfully completed) as well as regular attendance of exercises (usually a maximum of 2 incidents of unexcused absence).</td>
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</tbody>
</table>

### Contents

This module discusses modern stereoselective synthesis methods. It focuses on selected total syntheses, organometallic chemistry and catalysis.

### Intended learning outcomes

Students are able to stereoselectively plan complex chemical syntheses and to stereochemically analyse them. They can explain total syntheses. They can describe aspects of organometallic chemistry and catalysis in synthesis chemistry.

### Courses (type, number of weekly contact hours, language — if other than German)

<table>
<thead>
<tr>
<th>S + Ü (no information on SWS (weekly contact hours) and course language available)</th>
</tr>
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</table>

### Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) 1 to 3 written examinations (60 or 90 minutes) or b) oral examination of one candidate each (20 minutes) or c) oral examination in groups (groups of 2, 30 minutes). Should there be the option to choose between several methods of assessment, the module coordinator will choose the method to be used for the module component in the current semester at the beginning of the course.

Language of assessment: German or English

### Allocation of places

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### Additional information

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### Referred to in LPO I (examination regulations for teaching-degree programmes)

--
### Module title
Computational Chemistry

### Abbreviation
08-TCM2-102-m01

### Module coordinator
lecturer of lecture "Computational Chemistry"

### Module offered by
Institute of Physical and Theoretical Chemistry

### ECTS
5

### Method of grading
numerical grade

### Only after succ. compl. of module(s)
--

### Duration
1 semester

### Module level
graduate

### Other prerequisites
Admission prerequisite to assessment: successful completion of exercises in the respective classes as specified at the beginning of the course (usually 70% of exercises to be successfully completed) as well as regular attendance of exercises (usually a maximum of 2 incidents of unexcused absence).

## Contents
The module introduces students to computational chemistry.

## Intended learning outcomes
Students are able to explain the theoretical principles of computational chemistry and to apply methods in computational chemistry.

### Courses
(S + Ü (no information on SWS (weekly contact hours) and course language available)

### Type, number of weekly contact hours, language — if other than German
S + Ü

### Method of assessment
written examination (90 minutes)

### Language of assessment: German or English
German or English

## Allocation of places
--

## Additional information
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## Referred to in LPO I
(examination regulations for teaching-degree programmes)
--
## Module Catalogue for the Subject Chemistry

### Master's with 1 major, 120 ECTS credits

<table>
<thead>
<tr>
<th>Module title</th>
<th>Abbreviation</th>
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<tbody>
<tr>
<td>Advanced transition metal chemistry</td>
<td>08-HKM4-102-m01</td>
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<table>
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<th>Module offered by</th>
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<tbody>
<tr>
<td>lecturer of the seminar &quot;Spezielle Übergangsmetallchemie&quot;</td>
<td>Institute of Inorganic Chemistry</td>
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<td>1 semester</td>
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</table>

### Contents

This module provides students with deeper insights into topics in the chemistry of transition metals and coordination chemistry. It also provides an introduction to bioinorganic chemistry and discusses recent developments in transition metal chemistry.

### Intended learning outcomes

Students are able to explain transition metals and coordination compounds demonstrating a high degree of expertise in the field. They can explain the fundamental principles of bioinorganic chemistry.

### Courses

<table>
<thead>
<tr>
<th>(type, number of weekly contact hours, language — if other than German)</th>
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### Method of assessment

a) 1 to 3 written examinations (60 or 90 minutes) or b) oral examination of one candidate each (20 minutes) or c) oral examination in groups (groups of 2, 30 minutes). Should there be the option to choose between several methods of assessment, the module coordinator will choose the method to be used for the module component in the current semester at the beginning of the course.

Language of assessment: German or English

### Allocation of places

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### Additional information

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### Referred to in LPO 1

(examination regulations for teaching-degree programmes)
Medicinal Chemistry
(25 ECTS credits)
Compulsory Courses

(25 ECTS credits)
<table>
<thead>
<tr>
<th>Module title</th>
<th>Abbreviation</th>
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<tbody>
<tr>
<td>Principles of drug design</td>
<td>08-MCM3-102-m01</td>
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<tbody>
<tr>
<td>Pharmazeutische Chemie (Pharmaceutical Chemistry)</td>
<td>Institute of Pharmacy and Food Chemistry</td>
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<tbody>
<tr>
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</table>

### Contents

Fundamentals: drug targets (types and classification), target validation, effect mechanisms, protein-ligand interactions, lead finding; lead optimisation. Experimental methods: bioassays, HTS, combinatorial chemistry, naturally occurring substances. Theoretical methods: molecular modelling, structure-based drug design, pharmacophore models, docking, virtual screening, simulation methods, de novo design. Ligand-based drug design. QSAR. Predictions of pharmacokinetic and toxicological components (ADME). Case examples, prodrug strategies, bioisosterism, SAR.

### Intended learning outcomes

The student masters theoretical and experimental methods and aspects of drug design.

### Courses

S + Ü (no information on SWS (weekly contact hours) and course language available)

### Method of assessment

Presentation with discussion (approx. 30 minutes)
Language of assessment: German or English

### Allocation of places

Chemistry Master's and Mathematics Master's: no restrictions. Biochemistry Master's: 10 places. Places will be allocated by lot.

### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

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<table>
<thead>
<tr>
<th>Module title</th>
<th>Abbreviation</th>
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<tbody>
<tr>
<td>Practical course medicinal chemistry</td>
<td>08-MCM1-102-m01</td>
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</table>

**Module coordinator**

Lecturers: Pharmazeutische Chemie (Pharmaceutical Chemistry)

**Module offered by**

Institute of Pharmacy and Food Chemistry

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</table>

**Contents**

Selected methods and topics in medicinal chemistry (synthesis, testing, analysis, theory, pharmacokinetics).

**Intended learning outcomes**

Students have developed a knowledge of medicinal chemistry and are able to apply it to practical experiments.

**Courses**

P (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

Vortestate (pre-experiment exams) and Nachtestate (post-experiment exams) (approx. 20 minutes), assessment of practical performance, written report (approx. 30 to 50 pages)

Language of assessment: German or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

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<table>
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<td>Pharmazeutische Chemie (Pharmaceutical Chemistry)</td>
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<td>3 semester</td>
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</table>

**Contents**

Chemistry of drugs by field of indication; principles of drug development, strategies for active agent discovery; structure-activity relationships; molecular effect mechanisms; pharmacological principles of the drugs discussed in the module; drug analysis; drug synthesis; biotransformation, pharmacokinetics of individual drugs; history of drug development: discussion of specific examples.

**Intended learning outcomes**

The students acquire knowledge of pharmaceutic/medical chemistry and the according methods of their characterization.

**Courses**

V (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

oral examination of one candidate each (approx. 30 minutes)

Language of assessment: German or English

**Allocation of places**

--

**Additional information**

--

**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

--
Supramolecular Chemistry
(25 ECTS credits)
Compulsory Courses

(10 ECTS credits)
### Module title
Supramolecular Chemistry (Basics)

### Abbreviation
08-SCM1-102-m01

### Module coordinator
Lecturer of lecture "Organischen Chemie"

### Module offered by
Faculty of Chemistry and Pharmacy

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### Duration
1 semester

### Module level
graduate

### Other prerequisites
--

### Contents
This module introduces students to the fundamental principles of supramolecular chemistry. It focuses on interactions between molecules, molecular recognition by receptors, complexes, supramolecular polymers, coordination polymers and networks, liquid crystals, self-assembly in aqueous media, synthetic ion channels and modern applications of supramolecular chemistry.

### Intended learning outcomes
Students are able to explain interactions between molecules demonstrating a high degree of expertise in the field as well as to describe the formation, structure and polymers of coordination compounds. They are able to describe the self-assembly of polymers in aqueous media as well as to identify the characteristics of synthetic ion channels. They can name modern applications of supramolecular chemistry.

### Courses
S (no information on SWS (weekly contact hours) and course language available)

### Method of assessment
written examination (approx. 90 minutes) or oral examination of one candidate each (approx. 20 minutes)

Language of assessment: German or English

### Allocation of places
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### Additional information
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### Referred to in LPO I
(examination regulations for teaching-degree programmes)

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<table>
<thead>
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<td>Supramolecular Chemistry (Practical Course)</td>
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<th>Module offered by</th>
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<tbody>
<tr>
<td>lecturer of lecture &quot;Supramolekularen Chemie (Organische Chemie/Physikalische Chemie)&quot;</td>
<td>Faculty of Chemistry and Pharmacy</td>
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<tbody>
<tr>
<td>1 semester</td>
<td>graduate</td>
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</table>

**Contents**

This module gives students the opportunity to perform some of the key experiments in supramolecular chemistry. They will perform syntheses of host-guest complexes, dye aggregates and nanoparticles and use advanced analytical methods to characterise them.

**Intended learning outcomes**

Students are able to perform syntheses of host-guest complexes and use spectroscopic methods to analyse and characterise them. They are able to produce nanoparticles and to characterise them microscopically.

**Courses**

(type, number of weekly contact hours, language — if other than German)

P (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

practical work, logs (approx. 5 pages each)

Language of assessment: German or English

**Allocation of places**

--

**Additional information**

--

**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

--
Compulsory Electives

(15 ECTS credits)
## Bioinorganic Chemistry

### Abbreviation
08-ACM2-102-m01

### Module coordinator
lecturer of seminar "Anorganische Aspekte der Biochemie and Medizinischen Chemie" (Inorganic Aspects of Biochemistry and Medicinal Chemistry)

### Module offered by
Institute of Inorganic Chemistry

### ECTS
5

### Method of grading
numerical grade

### Only after succ. compl. of module(s)
--

### Duration
1 semester

### Module level
graduate

### Other prerequisites
--

### Contents
This module introduces students to the fundamental principles of bioinorganic chemistry (BIC). It discusses the methods of BIC, structures and effects of metalliferous enzymes and applications of BIC in the fields of diagnosis and therapy.

### Intended learning outcomes
Students are able to describe the principles of, and methods in, BIC. They can explain the structure and effects of metalliferous enzymes and describe applications of BIC in biochemistry and medicine.

### Courses
(no information on SWS (weekly contact hours) and course language available)

### Method of assessment
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) 1 to 3 written examinations (60 or 90 minutes) or b) oral examination of one candidate each (20 minutes) or c) oral examination in groups (groups of 2, 30 minutes). Should there be the option to choose between several methods of assessment, the module coordinator will choose the method to be used for the module component in the current semester at the beginning of the course.

Language of assessment: German or English

### Allocation of places
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### Additional information
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### Referred to in LPO I
(examination regulations for teaching-degree programmes)
--
### Module title
**Organic Functional Materials**

### Abbreviation
08-OCM-FM-102-m01

### Module coordinator
Lecturer of the seminar "Organische Funktionsmaterialien"

### Module offered by
Institute of Organic Chemistry

### ECTS
5

### Method of grading
Only after succ. compl. of module(s)

### Duration
1 semester

### Module level
graduate

### Other prerequisites
--

## Contents
This module discusses advanced topics in organic functional materials. It focuses on basic physical effects, organic solids, the application of organic functional materials as well as organic and metal-organic polymer chemistry.

## Intended learning outcomes
Students are able to explain the basic physical properties of organic functional materials. They are able to name and characterise organic solids and their applications in modern chemistry. Students are able to outline the fundamental principles of organic and metal-organic polymer chemistry and to name polymers of technological importance.

## Courses
(type, number of weekly contact hours, language — if other than German)
S (no information on SWS (weekly contact hours) and course language available)

## Method of assessment
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) 1 to 3 written examinations (60 or 90 minutes) or b) oral examination of one candidate each (20 minutes) or c) oral examination in groups (groups of 2, 30 minutes). Should there be the option to choose between several methods of assessment, the module coordinator will choose the method to be used for the module component in the current semester at the beginning of the course.

Language of assessment: German or English

## Allocation of places
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## Additional information
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## Referred to in LPO I
(examination regulations for teaching-degree programmes)
--
Module title | Abbreviation
---|---
Bioorganic Chemistry | 08-SCM3-102-m01

Module coordinator | Module offered by
lecturer of lecture "Bioorganische Chemie" (Bioorganic Chemistry) | Institute of Organic Chemistry

<table>
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<th>ECTS</th>
<th>Method of grading</th>
<th>Only after succ. compl. of module(s)</th>
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<tbody>
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<td>1 semester</td>
<td>graduate</td>
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</table>

Contents

This module discusses topics at the interface of organic chemistry, biology and medicine. It focuses on molecular interactions and recognition, molecular diversity, active agent development, new aspects of DNA, RNA, proteins and carbohydrates.

Intended learning outcomes

Students are able to describe molecular interactions and detection mechanisms of bioorganic chemistry. They can explain the molecular diversity of biological systems. They can characterise the fabrication of agents. They can describe modern aspects of DNA, RNA, proteins and carbohydrates.

Courses (type, number of weekly contact hours, language — if other than German)

S (no information on SWS (weekly contact hours) and course language available)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) 1 to 3 written examinations (60 or 90 minutes) or b) oral examination of one candidate each (20 minutes) or c) oral examination in groups (groups of 2, 30 minutes). Should there be the option to choose between several methods of assessment, the module coordinator will choose the method to be used for the module component in the current semester at the beginning of the course.

Language of assessment: German or English

Allocation of places

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Additional information

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Referred to in LPO I (examination regulations for teaching-degree programmes)

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<table>
<thead>
<tr>
<th>Module title</th>
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<tbody>
<tr>
<td>Computational Chemistry</td>
<td>08-TCM2-102-m01</td>
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**Module coordinator**

lecturer of lecture "Computational Chemistry"

**Module offered by**

Institute of Physical and Theoretical Chemistry

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<tbody>
<tr>
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<td>graduate</td>
<td>Admission prerequisite to assessment: successful completion of exercises in the respective classes as specified at the beginning of the course (usually 70% of exercises to be successfully completed) as well as regular attendance of exercises (usually a maximum of 2 incidents of unexcused absence).</td>
</tr>
</tbody>
</table>

**Contents**

The module introduces students to computational chemistry.

**Intended learning outcomes**

Students are able to explain the theoretical principles of computational chemistry and to apply methods in computational chemistry.

**Courses** (type, number of weekly contact hours, language — if other than German)

S + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (90 minutes)

Language of assessment: German or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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<table>
<thead>
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<th>Module title</th>
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<tr>
<td>Nanoscale Materials</td>
<td>08-PCM3-102-m01</td>
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### Module coordinator
Lecturer of the seminar "Nanoskalige Materialien"

### Module offered by
Institute of Physical and Theoretical Chemistry

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</table>

### Contents
This module discusses advanced topics in nanoscale materials. It focuses on the structure, properties, fabrication, modern characterisation methods and application areas of nanoscale materials.

### Intended learning outcomes
Students are able to characterise nanoscale materials. They are able to name analytical methods and application areas of nanoscale materials.

### Courses
S + Ü (no information on SWS (weekly contact hours) and course language available)

### Method of assessment
written examination (90 minutes) or oral examination of one candidate each (20 minutes) or talk (30 minutes)
Language of assessment: German or English

### Allocation of places
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### Additional information
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### Referred to in LPO I
(examination regulations for teaching-degree programmes)
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<table>
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<tr>
<td>Physical chemistry of supramolecular assemblies</td>
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**Module coordinator**

lecturer of the seminar "Physikalische Chemie Supramolekularer Strukturen" by Institute of Physical and Theoretical Chemistry

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</table>

**Duration**

1 semester

**Module level**

graduate

**Other prerequisites**

--

**Contents**

This module examines the basic interactions between molecules. It discusses the formation and physical-chemical properties of aggregates as well as key applications of supramolecular chemistry.

**Intended learning outcomes**

Students are able to explain the basic interactions between molecules demonstrating a high degree of expertise in the field. They can describe the formation and physical-chemical properties of aggregates. They can name modern applications of supramolecular chemistry.

**Courses**

S + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

written examination (90 minutes) and/or oral examination of one candidate each (20 minutes) and/or talk (30 minutes)

Language of assessment: German or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I**

( examination regulations for teaching-degree programmes)

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Module title | Abbreviation
---|---
Principles of drug design | 08-MCM3-102-m01

**Module coordinator**

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<th>Lectures</th>
<th>Module offered by</th>
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<tr>
<td>Pharmazeutische Chemie (Pharmaceutical Chemistry)</td>
<td>Institute of Pharmacy and Food Chemistry</td>
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**ECTS**<br>Method of grading | Only after succ. compl. of module(s)<br>numerical grade | -- |

**Duration**<br>Module level | Other prerequisites<br>graduate | -- |

**Contents**

Fundamentals: drug targets (types and classification), target validation, effect mechanisms, protein-ligand interactions, lead finding; lead optimisation. Experimental methods: bioassays, HTS, combinatorial chemistry, naturally occurring substances. Theoretical methods: molecular modelling, structure-based drug design, phar-macophore models, docking, virtual screening, simulation methods, de novo design. Ligand-based drug design. QSAR. Predictions of pharmacokinetic and toxicological components (ADME). Case examples, prodrug strategies, bioisosterism, SAR.

**Intended learning outcomes**

The student masters theoretical and experimental methods and aspects of drug design.

**Courses** (type, number of weekly contact hours, language — if other than German)<br>S + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Presentation with discussion (approx. 30 minutes)

Language of assessment: German or English

**Allocation of places**

Chemistry Master's and Mathematics Master's: no restrictions. Biochemistry Master's: 10 places. Places will be allocated by lot.

**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--
Theoretical Chemistry
(25 ECTS credits)
Compulsory Courses

(20 ECTS credits)
### Module title

**Theoretical Chemistry**

### Abbreviation

08-TCM1-102-m01

### Module coordinator

- Lecturer of lecture "Theoretische Chemie"

### Module offered by

Institute of Physical and Theoretical Chemistry

### ECTS

- **5**

### Method of grading

- **Numerical grade**

### Only after succ. compl. of module(s)

- **--**

### Duration

- **1 semester**

### Module level

- **Graduate**

### Other prerequisites

Admission prerequisite to assessment: successful completion of exercises in the respective classes as specified at the beginning of the course (usually 70% of exercises to be successfully completed) as well as regular attendance of exercises (usually a maximum of 2 incidents of unexcused absence).

### Contents

The module introduces students to theoretical chemistry.

### Intended learning outcomes

Students are able to describe the mathematical and physical principles underlying the quantum chemical and quantum dynamical approaches of theoretical chemistry.

### Courses

**S + Ü** (no information on SWS (weekly contact hours) and course language available)

### Method of assessment

**Written examination (90 minutes)**

Language of assessment: German or English

### Allocation of places

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### Additional information

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### Referred to in LPO I

(Examination regulations for teaching-degree programmes)

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<td>lecturer of lecture &quot;Programmieren in Theoretischer Chemie&quot;</td>
<td>Institute of Physical and Theoretical Chemistry</td>
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<tr>
<td>Other prerequisites</td>
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<tr>
<td>Contents</td>
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<tr>
<td>This module provides an introduction to the fundamentals of programming in theoretical chemistry and discusses its application areas.</td>
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<tr>
<td>Intended learning outcomes</td>
<td></td>
</tr>
<tr>
<td>Students are able to explain and use one of the programming languages typically used in theoretical chemistry as well as to name its application areas.</td>
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<td>Courses</td>
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<td>(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)</td>
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<td>completion and discussion of approx. 5 programming exercises as well as talk (approx. 45 minutes)</td>
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<td>Language of assessment: German or English</td>
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<td>Allocation of places</td>
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<td>Additional information</td>
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<td>Theoretical Chemistry - Project work</td>
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<td>head of the research group offering the module</td>
<td>Institute of Physical and Theoretical Chemistry</td>
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<td>1 semester</td>
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### Contents

This module gives students the opportunity to get involved in the work of one of the research groups based at the Institute of Theoretical Chemistry and learn some of the methods typically used in the discipline.

### Intended learning outcomes

Students have learned some of the methods typically used in theoretical chemistry. They are able to explain issues that are relevant to the fields covered.

### Courses

This module has 3 components; information on courses listed separately for each component.

- 08-TCAP-1-102: P (no information on language and number of weekly contact hours available)
- 08-TCAP-2-102: P (no information on language and number of weekly contact hours available)
- 08-TCAP-3-102: P (no information on language and number of weekly contact hours available)

### Method of assessment

This module has the following 3 assessment components. To pass the module as a whole students must pass two out of these three assessment components.

**Assessment component to module component 08-TCAP-1-102:** Theoretische Chemie Arbeitsgruppenpraktikum Wellenpaketdynamik
- 5 ECTS credits, method of grading: (not) successfully completed
- presentation (approx. 30 minutes)
- Language of assessment: German or English

**Assessment component to module component 08-TCAP-2-102:** Theoretische Chemie Arbeitsgruppenpraktikum Wellenfunktionsmethoden
- 5 ECTS credits, method of grading: (not) successfully completed
- presentation (approx. 30 minutes)
- Language of assessment: German or English

**Assessment component to module component 08-TCAP-3-102:** Theoretische Chemie Arbeitsgruppenpraktikum Dichtefunktionaltheorie
- 5 ECTS credits, method of grading: (not) successfully completed
- presentation (approx. 30 minutes)
- Language of assessment: German or English

### Allocation of places

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### Additional information

Additional information on module duration: 4 weeks..

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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Compulsory Electives

(5 ECTS credits)
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<tr>
<td>Computational Chemistry</td>
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**Module coordinator**  
I lecturers of lecture "Computational Chemistry"  
Institute of Physical and Theoretical Chemistry

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**Duration**  
1 semester  
1 semester  
Graduate

**Other prerequisites**  
Admission prerequisite to assessment: successful completion of exercises in the respective classes as specified at the beginning of the course (usually 70% of exercises to be successfully completed) as well as regular attendance of exercises (usually a maximum of 2 incidents of unexcused absence).

**Contents**  
The module introduces students to computational chemistry.

**Intended learning outcomes**  
Students are able to explain the theoretical principles of computational chemistry and to apply methods in computational chemistry.

**Courses** (type, number of weekly contact hours, language — if other than German)  
S + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)  
written examination (90 minutes)  
Language of assessment: German or English

**Allocation of places**  
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**Additional information**  
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**Referred to in LPO I** (examination regulations for teaching-degree programmes)  
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<table>
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<tr>
<td>Principles of drug design</td>
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**Contents**

Fundamentals: drug targets (types and classification), target validation, effect mechanisms, protein-ligand interactions, lead finding; lead optimisation. Experimental methods: bioassays, HTS, combinatorial chemistry, naturally occurring substances. Theoretical methods: molecular modelling, structure-based drug design, pharmacophore models, docking, virtual screening, simulation methods, de novo design. Ligand-based drug design. QSAR. Predictions of pharmacokinetic and toxicological components (ADME). Case examples, prodrug strategies, bioisosterism, SAR.

**Intended learning outcomes**

The student masters theoretical and experimental methods and aspects of drug design.

**Courses** (type, number of weekly contact hours, language — if other than German)

S + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

presentation with discussion (approx. 30 minutes)

Language of assessment: German or English

**Allocation of places**

Chemistry Master's and Mathematics Master's: no restrictions. Biochemistry Master's: 10 places. Places will be allocated by lot.

**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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Compulsory Electives Additional Qualifications
(15 ECTS credits)
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<td>Chemically and biologically inspired Nanotechnology for Materials Synthesis</td>
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<tr>
<td>holder of the Chair of Chemical Technology of Material Synthesis</td>
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**Contents**

This module provides an introduction to the synthesis methods of sol-gel chemistry and discusses the methods of analysis used to characterise the generated materials. It also discusses the fundamental principles of biomineralisation and uses examples to introduce students to bio-inspired material synthesis.

**Intended learning outcomes**

Students have developed an advanced knowledge of sol-gel chemistry and biomineralisation.

**Courses**

This module comprises 2 module components. Information on courses will be listed separately for each module component.

- 08-NT-1-101: V (no information on SWS (weekly contact hours) and course language available)
- 08-NT-2-101: V (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

Assessment in this module comprises the assessments in the individual module components as specified below. Unless stated otherwise, successful completion of the module will require successful completion of all individual assessments.

**Assessment in module component 08-NT-1-101: Chemically and biologically inspired Nanotechnology for Materials Synthesis**

- 2 ECTS, Method of grading: numerical grade
- oral examination (approx. 15 minutes)

**Assessment in module component 08-NT-2-101: From Biomineralisation to biologically inspired Materials Synthesis**

- 3 ECTS, Method of grading: numerical grade
- oral examination (approx. 20 minutes)

**Allocation of places**

--

**Additional information**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--
### Module title

**Materials Science 1 (Basic Introduction)**

| Abbreviation | 08-FS1:101-m01 |

### Module coordinator

Dean of Studies Funktionswerkstoffe (Functional Materials)  
Chair of Chemical Technology of Material Synthesis

### ECTS

| 5 | numerical grade | Only after succ. compl. of module(s) |

### Duration

| 1 semester | undergraduate | Other prerequisites |

### Contents

This module discusses the fundamental relations between chemical bonding, the structure, the microstructure and the properties of materials.

### Intended learning outcomes

Students have become familiar with the fundamental relations between chemical bonding, the structure, the microstructure and the properties of materials. They have developed the ability to apply them to research problems.

### Courses

V + Ü (no information on SWS (weekly contact hours) and course language available)

### Method of assessment

written examination (90 minutes)

### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

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<table>
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<td>Materials Science 2 (The Major Material Groups)</td>
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<tbody>
<tr>
<td>Dean of Studies Funktionswerkstoffe (Functional Materials)</td>
<td>Chair of Chemical Technology of Material Synthesis</td>
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</table>

**Contents**

This module deals with production and properties of the most important materials groups.

**Intended learning outcomes**

The students possess comprehensive knowledge about fabrication and properties of the major classes of materials and are able to apply this to scientific problems.

**Courses**

(type, number of weekly contact hours, language — if other than German)

V + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (approx. 90 minutes)

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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<table>
<thead>
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<th>Module title</th>
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<td>Toxicology and legal studies</td>
<td>03-TR-072-m01</td>
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<tbody>
<tr>
<td>lecturer of lecture &quot;Toxikologie und Rechtskunde&quot;</td>
<td>Faculty of Medicine</td>
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**Contents**
Basics of legal regulations for chemists (handling and transportation of hazardous materials), fundamentals of toxicology.

**Intended learning outcomes**
The students master the basics of legal regulations for chemists (handling and transport of hazardous substances) as well as the fundamentals of toxicology.

**Courses**
V + V (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**
written examination (approx. 90 minutes)

**Allocation of places**
--

**Additional information**
--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)
--
### Module title
Biochemistry

### Abbreviation
08-BC-092-m01

### Module coordinator
holder of the Chair of Biochemistry

### Module offered by
Chair of Biochemistry

### ECTS
6

### Method of grading
Only after succ. compl. of module(s)

### Duration
2 semester

### Module level
undergraduate

### Other prerequisites
Admission prerequisite to assessment: successful completion of exercises in the respective classes as specified at the beginning of the course (usually 70% of exercises to be successfully completed) as well as regular attendance of exercises (usually a maximum of 2 incidents of unexcused absence).

### Contents
The module imparts the basic knowledge of biochemistry by lectures and in-depth tutorials.

### Intended learning outcomes
Students have become familiar with the fundamental principles of biochemistry. They are able to describe the key biochemical processes in cellular systems.

### Courses
\( V + Ü + V + Ü \) (no information on SWS (weekly contact hours) and course language available)

### Method of assessment
- a) 1 to 3 written examinations (1 written examination: approx. 90 minutes; 2 written examinations: approx. 60 or 90 minutes each; 3 written examinations: approx. 60 minutes each) or
- b) oral examination of one candidate each (approx. 20 minutes) or
- c) oral examination in groups (groups of 2, approx. 30 minutes)

### Allocation of places
--

### Additional information
--

### Referred to in LPO I
(examination regulations for teaching-degree programmes)
--
Module title | Abbreviation
--- | ---
Biochemistry Lab | 08-BCP-092-m01

Module coordinator | Module offered by
holder of the Chair of Biochemistry | Chair of Biochemistry

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<td>undergraduate</td>
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</table>

Contents
In this module the basics of scientific biochemical experimentation shall be practiced in practical exercises.

Intended learning outcomes
After participating in the practical exercises the students master basic biochemical methods and are able to purposefully apply them.

Courses (type, number of weekly contact hours, language — if other than German)
P (no information on SWS (weekly contact hours) and course language available)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
pre/post-experiment examination talks (Vortestate and Nachtestate, approx. 15 minutes each), practical work (log, approx. 5 to 10 pages)
Assessment offered: once a year, summer semester

Allocation of places
Number of places: 24. Should the number of applications exceed the number of available places, places will be allocated in a standardised procedure among all applicants irrespective of their subjects according to the following quotas: Quota 1 (80% of places): grade achieved in module 08-BC; among applicants with the same grade, places will be allocated by lot. Quota 2 (20% of places): number of subject semesters of the respective applicant; among applicants with the same number of subject semesters, places will be allocated by lot. A waiting list will be maintained and places re-allocated as they become available.

Additional information
---

Referred to in LPO I (examination regulations for teaching-degree programmes)
---
## Module title
Advanced Inorganic Chemistry

## Abbreviation
08-ACM1-102-m01

## Module coordinator
Managing Director of the Institute of Inorganic Chemistry

## Module offered by
Institute of Inorganic Chemistry

## ECTS
20

## Method of grading
Only after succ. compl. of module(s)

## Duration
2 semester

## Module level
graduate

## Other prerequisites
--

## Contents
This module discusses advanced topics in main group chemistry and transition metal chemistry. It focuses on special compounds of the main group elements (MGEs), bonding situations of MGEs and MGE compounds, the chemistry of transition metals and coordination chemistry. The course gives students the opportunity to enhance their skills in advanced synthesis and analytical methods in inorganic chemistry. The focus will be on working under inert atmospheres, purification methods, spectral analysis and crystallography. Students will be expected to conduct their work in the lab independently, write a lab report documenting their findings and deliver a presentation.

## Intended learning outcomes
Students are able to characterise and explain special compounds of the main group elements. They can describe the chemical properties of transition metals and analyse the structure as well as chemical and physical aspects of coordination compounds. Students are able to use advanced synthesis and analytical methods in inorganic chemistry in the lab and to interpret their findings. They are able to write a lab report documenting their findings and deliver a presentation.

## Courses
This module comprises 2 module components. Information on courses will be listed separately for each module component.

- 08-ACM1-1-102: S + S (no information on SWS (weekly contact hours) and course language available)
- 08-ACM1-2-102: P (no information on SWS (weekly contact hours) and course language available)

## Method of assessment
Assessment in this module comprises the assessments in the individual module components as specified below. Unless stated otherwise, successful completion of the module will require successful completion of all individual assessments.

### Assessment in module component 08-ACM1-1-102: Inorganic Chemistry for advanced students

- 10 ECTS, Method of grading: numerical grade
- a) 1 to 3 written examinations (90 to 120 minutes each) or b) oral examination of one candidate each (30 minutes) or c) oral examination in groups (groups of 2, 45 minutes)
- Language of assessment: German or English

### Assessment in module component 08-ACM1-2-102: Inorganic Chemistry practical course for advanced

- 10 ECTS, Method of grading: (not) successfully completed
- practical work with lab report (20 pages) and talk (15 minutes)
- Language of assessment: German or English

## Allocation of places
--

## Additional information
--

## Referred to in LPO I
(examination regulations for teaching-degree programmes)

--
Module title | Abbreviation
---|---
Bioinorganic Chemistry | 08-ACM2-102-m01

Module coordinator | Module offered by
---|---
Lecturer of seminar "Anorganische Aspekte der Biochemie and Medizinischen Chemie" (Inorganic Aspects of Biochemistry and Medicinal Chemistry) | Institute of Inorganic Chemistry

| ECTS | Method of grading | Only after succ. compl. of module(s) |
---|---|---
5 | numerical grade | -- |

| Duration | Module level | Other prerequisites |
---|---|---
1 semester | graduate | -- |

Contents

This module introduces students to the fundamental principles of bioinorganic chemistry (BIC). It discusses the methods of BIC, structures and effects of metalliferous enzymes and applications of BIC in the fields of diagnosis and therapy.

Intended learning outcomes

Students are able to describe the principles of, and methods in, BIC. They can explain the structure and effects of metalliferous enzymes and describe applications of BIC in biochemistry and medicine.

Method of assessment

(a) 1 to 3 written examinations (60 or 90 minutes) or (b) oral examination of one candidate each (20 minutes) or (c) oral examination in groups (groups of 2, 30 minutes). Should there be the option to choose between several methods of assessment, the module coordinator will choose the method to be used for the module component in the current semester at the beginning of the course.

Language of assessment: German or English

Allocation of places

Additional information

Referred to in LPO I (examination regulations for teaching-degree programmes)
Module title: Solid state chemistry and inorganic materials
Abbreviation: 08-ACM3-102-m01

Module coordinator: Lecturer of seminar "Festkörperchemie and Anorganische Materialien" (Solid State Chemistry and Inorganic Materials)
Module offered by: Institute of Inorganic Chemistry

ECTS: 5
Method of grading: numerical grade
Only after succ. compl. of module(s): --
Duration: 1 semester
Module level: graduate
Other prerequisites: --

Contents:
This module provides an introduction to solid-state chemistry. It focuses on the structure, chemical and physical properties, synthesis methods and selected materials of solids.

Intended learning outcomes:
Students are able to describe the structure and properties of solids. They can explain methods for solid-state synthesis. They can describe important aspects of selected materials regarding the corresponding solids.

Courses:
S (no information on SWS (weekly contact hours) and course language available)

Method of assessment:
(a) 1 to 3 written examinations (60 or 90 minutes) or (b) oral examination of one candidate each (20 minutes) or (c) oral examination in groups (groups of 2, 30 minutes). Should there be the option to choose between several methods of assessment, the module coordinator will choose the method to be used for the module component in the current semester at the beginning of the course.

Language of assessment: German or English

Allocation of places:
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Additional information:
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Referred to in LPO I (examination regulations for teaching-degree programmes):
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<tbody>
<tr>
<td>Advanced organometallic chemistry and its application in homogeneous catalysis</td>
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<td>lecturer of the seminar &quot;Spezielle Metallorganische Chemie and deren Anwendung in der Homogenkatalyse&quot;</td>
<td>Institute of Inorganic Chemistry</td>
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**Contents**

This module examines elementary organic compounds of transition metals with homogeneous catalytic applications.

**Intended learning outcomes**

Students can describe and analyse the structure, reactivity and analysis of elementary organic compounds. They are able to characterise special substance classes. They can formulate homogeneous catalysis reactions.

**Courses** (type, number of weekly contact hours, language — if other than German)

S (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

- a) 1 to 3 written examinations (60 or 90 minutes) or b) oral examination of one candidate each (20 minutes) or c) oral examination in groups (groups of 2, 30 minutes). Should there be the option to choose between several methods of assessment, the module coordinator will choose the method to be used for the module component in the current semester at the beginning of the course.

Language of assessment: German or English

**Allocation of places**

--

**Additional information**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--
Module title | Abbreviation
--- | ---
Modern Synthetic Method | 08-OCM-SYNT-102-m01

Module coordinator | Module offered by
Lecturer of the seminar | Institute of Organic Chemistry

ECTS | Method of grading | Only after succ. compl. of module(s)
--- | --- | ---
5 | numerical grade | --

Duration | Module level | Other prerequisites
--- | --- | ---
1 semester | graduate | Admission prerequisite to assessment: successful completion of exercises in the respective classes as specified at the beginning of the course (usually 70% of exercises to be successfully completed) as well as regular attendance of exercises (usually a maximum of 2 incidents of unexcused absence).

Contents
This module discusses modern stereoselective synthesis methods. It focuses on selected total syntheses, organometallic chemistry and catalysis.

Intended learning outcomes
Students are able to stereoselectively plan complex chemical syntheses and to stereochemically analyse them. They can explain total syntheses. They can describe aspects of organometallic chemistry and catalysis in synthesis chemistry.

Courses (type, number of weekly contact hours, language — if other than German)
S + Ü (no information on SWS (weekly contact hours) and course language available)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
a) 1 to 3 written examinations (60 or 90 minutes) or b) oral examination of one candidate each (20 minutes) or c) oral examination in groups (groups of 2, 30 minutes). Should there be the option to choose between several methods of assessment, the module coordinator will choose the method to be used for the module component in the current semester at the beginning of the course.
Language of assessment: German or English

Allocation of places
--

Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
--
Module title | Abbreviation
--- | ---
Advanced NMR- and Mass Spectrometry | 08-OCM-NMRMS-102-m01

Module coordinator | Module offered by
lab course supervisor | Institute of Organic Chemistry

ECTS | Method of grading | Only after succ. compl. of module(s)
--- | --- | ---
5 | numerical grade | --

Duration | Module level | Other prerequisites
1 semester | graduate | --

Contents
This module equips students with an advanced knowledge of NMR and mass spectrometry. It offers deeper insights into the theoretical principles of the two measuring techniques and includes exercises that give students the opportunity to learn how to evaluate complicated spectra and use a spectrometer.

Intended learning outcomes
Students are able to discuss NMR and mass spectroscopy demonstrating a high degree of expertise in the field. They are able to experiment with both spectrometers and analyse complicated spectra.

Courses (type, number of weekly contact hours, language — if other than German)
P (no information on SWS (weekly contact hours) and course language available)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) 1 to 3 written examinations (60 or 90 minutes) or b) oral examination of one candidate each (20 minutes) or c) oral examination in groups (groups of 2, 30 minutes)

Language of assessment: German or English

Allocation of places
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Additional information
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<tr>
<td>head of the research group</td>
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**Contents**

This module gives students the opportunity to get involved in the work of one of the research groups based at the Institute of Organic Chemistry and learn some advanced synthesis and analytical methods.

**Intended learning outcomes**

Students are able to describe and use some of the synthesis and analytical methods typically used by the research group as well as to describe theoretical aspects.

**Courses** (type, number of weekly contact hours, language — if other than German)

P (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Talk (approx. 15 minutes) and log (approx. 15 to 20 pages)

Language of assessment: German or English

**Allocation of places**

--

**Additional information**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--
## Module Catalogue for the Subject Chemistry
### Master's with 1 major, 120 ECTS credits

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<td>Modern Aspects of Natural Product Chemistry and Biological Chemistry</td>
<td>08-OCM-NAT-102-m01</td>
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### Module coordinator
Lecturer of the seminar

### Module offered by
Institute of Organic Chemistry

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### Contents
This module discusses advanced topics in natural product chemistry and biological chemistry.

### Intended learning outcomes
Students are able to discuss advanced topics in natural product chemistry and biological chemistry.

### Courses
(S (no information on SWS (weekly contact hours) and course language available)

### Method of assessment
(a) 1 to 3 written examinations (60 or 90 minutes) or (b) oral examination of one candidate each (20 minutes) or (c) oral examination in groups (groups of 2, 30 minutes). Should there be the option to choose between several methods of assessment, the module coordinator will choose the method to be used for the module component in the current semester at the beginning of the course.

Language of assessment: German or English

### Allocation of places
Chemistry Master’s: no restrictions. Biochemistry Master’s: 20 places. Places will be allocated by lot.

### Additional information
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### Referred to in LPO I
(examination regulations for teaching-degree programmes)

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**Contents**

This module discusses advanced topics in organic functional materials. It focuses on basic physical effects, organic solids, the application of organic functional materials as well as organic and metal-organic polymer chemistry.

**Intended learning outcomes**

Students are able to explain the basic physical properties of organic functional materials. They are able to name and characterise organic solids and their applications in modern chemistry. Students are able to outline the fundamental principles of organic and metal-organic polymer chemistry and to name polymers of technological importance.

**Courses** (type, number of weekly contact hours, language — if other than German)

S (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) 1 to 3 written examinations (60 or 90 minutes) or b) oral examination of one candidate each (20 minutes) or c) oral examination in groups (groups of 2, 30 minutes). Should there be the option to choose between several methods of assessment, the module coordinator will choose the method to be used for the module component in the current semester at the beginning of the course.

Language of assessment: German or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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<table>
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<td>Organo- and Biocatalysis</td>
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<td>lecturer of the seminar &quot;Organo- and Biokatalyse&quot;</td>
<td>Institute of Organic Chemistry</td>
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**Contents**

This module provides students with deeper insights into topics in organic compounds and enzymes in catalytic processes. Organocatalysis: enantioselective implementation, principles, green chemistry, substance classes and application areas. Biocatalysis: effects of enzymes in view of different aspects, especially regarding organic synthesis.

**Intended learning outcomes**

Students are able to categorise organocatalysts and explain their effects and areas of application. They can describe the structure and applications of enzymes in organic synthesis. They are able to mechanistically describe and analyse the effects of enzymes.

**Courses** (type, number of weekly contact hours, language — if other than German)

| S (no information on SWS (weekly contact hours) and course language available) |

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

| a) 1 to 3 written examinations (60 or 90 minutes) or b) oral examination of one candidate each (20 minutes) or c) oral examination in groups (groups of 2, 30 minutes). Should there be the option to choose between several methods of assessment, the module coordinator will choose the method to be used for the module component in the current semester at the beginning of the course. |

Language of assessment: German or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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<td>Supramolecular Chemistry (Basics)</td>
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<tr>
<td>lecturer of lecture &quot;Organischen Chemie&quot;</td>
<td>Faculty of Chemistry and Pharmacy</td>
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</table>

**Contents**

This module introduces students to the fundamental principles of supramolecular chemistry. It focuses on interactions between molecules, molecular recognition by receptors, complexes, supramolecular polymers, coordination polymers and networks, liquid crystals, self-assembly in aqueous media, synthetic ion channels and modern applications of supramolecular chemistry.

**Intended learning outcomes**

Students are able to explain interactions between molecules demonstrating a high degree of expertise in the field as well as to describe the formation, structure and polymers of coordination compounds. They are able to describe the self-assembly of polymers in aqueous media as well as to identify the characteristics of synthetic ion channels. They can name modern applications of supramolecular chemistry.

**Courses**

S (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

written examination (approx. 90 minutes) or oral examination of one candidate each (approx. 20 minutes)

Language of assessment: German or English

**Allocation of places**

--

**Additional information**

--

**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

--
### Module title

**Bioorganic Chemistry**

### Abbreviation

08-SCM3-102-m01

### Module coordinator

Lecturer of lecture "Bioorganische Chemie" (Bioorganic Chemistry)

### Module offered by

Institute of Organic Chemistry

### ECTS

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### Contents

This module discusses topics at the interface of organic chemistry, biology and medicine. It focuses on molecular interactions and recognition, molecular diversity, active agent development, new aspects of DNA, RNA, proteins and carbohydrates.

### Intended learning outcomes

Students are able to describe molecular interactions and detection mechanisms of bioorganic chemistry. They can explain the molecular diversity of biological systems. They can characterise the fabrication of agents. They can describe modern aspects of DNA, RNA, proteins and carbohydrates.

### Courses

<table>
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<tr>
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<tbody>
<tr>
<td>S</td>
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</table>

### Method of assessment

- a) 1 to 3 written examinations (60 or 90 minutes) or b) oral examination of one candidate each (20 minutes) or c) oral examination in groups (groups of 2, 30 minutes). Should there be the option to choose between several methods of assessment, the module coordinator will choose the method to be used for the module component in the current semester at the beginning of the course.

Language of assessment: German or English

### Allocation of places

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### Additional information

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### Referred to in LPO 1

(examination regulations for teaching-degree programmes)

--
### Computational Chemistry

**Module title:** Computational Chemistry  
**Abbreviation:** 08-TCM2-102-m01

**Module coordinator:** lecturer of lecture "Computational Chemistry"  
**Module offered by:** Institute of Physical and Theoretical Chemistry

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<tr>
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<tbody>
<tr>
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</table>

**Duration:** 1 semester  
**Module level:** graduate  
**Other prerequisites:** Admission prerequisite to assessment: successful completion of exercises in the respective classes as specified at the beginning of the course (usually 70% of exercises to be successfully completed) as well as regular attendance of exercises (usually a maximum of 2 incidents of unexcused absence).

**Contents**

The module introduces students to computational chemistry.

**Intended learning outcomes**

Students are able to explain the theoretical principles of computational chemistry and to apply methods in computational chemistry.

**Courses** (type, number of weekly contact hours, language — if other than German)

S + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (90 minutes)  
Language of assessment: German or English

**Allocation of places**

--

**Additional information**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--
### Module Catalogue for the Subject Chemistry

#### Master's with 1 major, 120 ECTS credits

<table>
<thead>
<tr>
<th>Module title</th>
<th>Abbreviation</th>
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<tbody>
<tr>
<td>Advanced Physical Chemistry</td>
<td>08-PCM1-102-m01</td>
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</table>

#### Module coordinator

- **Module coordinator:** Lecturer of seminar "Laserspektroskopie" (Laser Spectroscopy)
- **Module offered by:** Institute of Physical and Theoretical Chemistry

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<tr>
<td>10</td>
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</table>

#### Contents

This module introduces students to the fundamental principles of laser spectroscopy. It discusses absorption and emission spectroscopy. In addition, the module gives students the opportunity to use modern experimental methods in physical chemistry in the laboratory. After a safety briefing, the students autonomously conduct experiments in the laboratory. Students will be expected to take tests and write lab reports to demonstrate their knowledge.

#### Intended learning outcomes

Students are able to explain the components and operating principles of lasers as well as the optical principles of laser technology. They are able to describe the principles of absorption and emission spectroscopy. Students have developed a high level of proficiency in modern experimental methods in physical chemistry. They are able to analyse the resulting measurements and write a lab report.

#### Courses

This module comprises 2 module components. Information on courses will be listed separately for each module component.

- **08-PCM1-1-102:** S + Ü (no information on SWS (weekly contact hours) and course language available)
- **08-PCM1-2-102:** P (no information on SWS (weekly contact hours) and course language available)

#### Method of assessment

Assessment in this module comprises the assessments in the individual module components as specified below. Unless stated otherwise, successful completion of the module will require successful completion of all individual assessments.

**Assessment in module component 08-PCM1-1-102:** Laser Spectroscopy Laser Spectroscopy

- 5 ECTS, Method of grading: numerical grade
- written examination (90 minutes) or oral examination (20 minutes)
- Language of assessment: German or English

**Assessment in module component 08-PCM1-2-102:** Advanced Physical Chemistry (Lab)

- 5 ECTS, Method of grading: (not) successfully completed
- Vortestate (pre-experiment exams) and Nachtestate (post-experiment exams) (approx. 15 minutes), log (approx. 15 pages)
- Language of assessment: German or English

#### Allocation of places

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#### Additional information

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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<table>
<thead>
<tr>
<th>Module title</th>
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<tr>
<td>Chemical Dynamics</td>
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<td>lecturer of seminar &quot;Chemische Dynamik&quot; (Chemical Dynamics)</td>
<td>Institute of Physical and Theoretical Chemistry</td>
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</table>

**Contents**

This module gives students the opportunity to explore advanced topics in chemical kinetics and reaction dynamics in more detail. It discusses methods and models for investigating and describing chemical reactions.

**Intended learning outcomes**

Students are able to discuss advanced topics in chemical kinetics and reaction dynamics. They can describe methods and models for investigating and describing chemical reactions.

**Courses**

(type, number of weekly contact hours, language — if other than German)

S + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (90 minutes) or oral examination of one candidate each (20 minutes) or talk (30 minutes) Language of assessment: German or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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<table>
<thead>
<tr>
<th>Module title</th>
<th>Abbreviation</th>
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<tr>
<td>Nanoscale Materials</td>
<td>08-PCM3-102-m01</td>
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<tbody>
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<td>lecturer of the seminar &quot;Nanoskalige Materialien&quot;</td>
<td>Institute of Physical and Theoretical Chemistry</td>
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**Contents**

This module discusses advanced topics in nanoscale materials. It focuses on the structure, properties, fabrication, modern characterisation methods and application areas of nanoscale materials.

**Intended learning outcomes**

Students are able to characterise nanoscale materials. They are able to name analytical methods and application areas of nanoscale materials.

**Courses**

(type, number of weekly contact hours, language — if other than German)

S + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (90 minutes) or oral examination of one candidate each (20 minutes) or talk (30 minutes)

Language of assessment: German or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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<th><strong>Module title</strong></th>
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<td>Ultrafast spectroscopy and quantum-control</td>
<td>08-PCM4-102-m01</td>
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<tr>
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<td>Institute of Physical and Theoretical Chemistry</td>
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</table>

**Contents**

This module discusses advanced topics in ultrafast spectroscopy and quantum control. It focuses on ultrashort laser pulses, time-resolved laser spectroscopy and coherent control.

**Intended learning outcomes**

Students are able to describe the generation of ultrashort laser pulses and to characterise them. They can explain the theory of time-resolved laser spectroscopy and name experimental methods. They can describe the principles and applications of quantum control.

**Courses** (type, number of weekly contact hours, language — if other than German)

S + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (90 minutes) or oral examination of one candidate each (20 minutes) or talk (30 minutes)

Language of assessment: German or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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<table>
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<td>Physical chemistry of supramolecular assemblies</td>
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<td>Institute of Physical and Theoretical Chemistry</td>
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<td>graduate</td>
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</table>

**Contents**

This module examines the basic interactions between molecules. It discusses the formation and physical-chemical properties of aggregates as well as key applications of supramolecular chemistry.

**Intended learning outcomes**

Students are able to explain the basic interactions between molecules demonstrating a high degree of expertise in the field. They can describe the formation and physical-chemical properties of aggregates. They can name modern applications of supramolecular chemistry.

**Courses** (type, number of weekly contact hours, language — if other than German)

S + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written examination (90 minutes) and/or oral examination of one candidate each (20 minutes) and/or talk (30 minutes)

Language of assessment: German or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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<table>
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<td>lecturers Physikalische Chemie (Physical Chemistry)</td>
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<td>1 semester</td>
<td>graduate</td>
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</table>

**Contents**

This module gives students the opportunity to get involved in the work of one of the research groups based at the Institute of Physical Chemistry and learn some advanced synthesis and analytical methods.

**Intended learning outcomes**

Students have become proficient in the research methods typically used by the relevant physical chemistry research group. They are able to analyse their findings and thus help answer topical questions in physical chemistry.

**Courses**

P (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

presentation (20 minutes)
Language of assessment: German or English

**Allocation of places**

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**Additional information**

--

**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

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### Module title

**Theoretical Chemistry**

<table>
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<th>Abbreviation</th>
<th>08-TCM1-102-m01</th>
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### Module coordinator

Lecturer of lecture "Theoretische Chemie"

### Module offered by

Institute of Physical and Theoretical Chemistry

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### Duration

1 semester

### Module level

graduate

### Other prerequisites

Admission prerequisite to assessment: successful completion of exercises in the respective classes as specified at the beginning of the course (usually 70% of exercises to be successfully completed) as well as regular attendance of exercises (usually a maximum of 2 incidents of unexcused absence).

### Contents

The module introduces students to theoretical chemistry.

### Intended learning outcomes

Students are able to describe the mathematical and physical principles underlying the quantum chemical and quantum dynamical approaches of theoretical chemistry.

### Courses

<table>
<thead>
<tr>
<th>Type</th>
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<tbody>
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### Method of assessment

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<th>Scope</th>
<th>Language — if other than German</th>
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<tr>
<td>written examination</td>
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Language of assessment: German or English

### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

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<table>
<thead>
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<tr>
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<tr>
<td>1 semester</td>
<td>undergraduate</td>
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</table>

**Contents**

The module covers specific topics of molecular physiology and functional biochemistry in lectures and exercises.

**Intended learning outcomes**

Students have developed a sound knowledge of molecular biology.

**Courses**

(\(\dddot{U} + V\) (no information on SWS (weekly contact hours) and course language available))

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

1 written examination (90 minutes) or 2 written examinations (60 to 90 minutes)

Language of assessment: German or English

**Allocation of places**

--

**Additional information**

--

**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

--
Module title | Abbreviation
---|---
Molecular Biology Practical Course | 08-BC-MOLP-102-m01

Module coordinator | Module offered by
holder of the Chair of Biochemistry | Chair of Biochemistry

ECTS | Method of grading | Only after succ. compl. of module(s)
---|---|---
5 | numerical grade | --

Duration | Module level | Other prerequisites
---|---|---
1 semester | undergraduate | --

Contents
The module provides practical skills in the fields of recombinant engineering and characterization of macromolecular complexes, current biomolecular techniques, analysis of biochemical processes in vivo, and up-to-date imaging techniques.

Intended learning outcomes
The student has knowledge of molecular biology and is able to apply the contents in practical experiments.

Courses (type, number of weekly contact hours, language — if other than German)

P (no information on SWS (weekly contact hours) and course language available)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

pre/post-experiment examination talks (Vor-/Nachtestate, approx. 15 minutes), log (approx. 5 to 10 pages)
Language of assessment: German or English

Allocation of places
Number of places: 12. Should the number of applications exceed the number of available places, places will be allocated in a standardised procedure among all applicants irrespective of their subjects according to the following quotas: Quota 1 (80% of places): grade achieved in module 08-BC; among applicants with the same grade, places will be allocated by lot. Quota 2 (20% of places): number of subject semesters of the respective applicant; among applicants with the same number of subject semesters, places will be allocated by lot. A waiting list will be maintained and places re-allocated as they become available.

Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
--
### Module title
Practical course "Molecular Machines" for advanced students

### Abbreviation
08-BC-VPMM-102-m01

### Module coordinator
holder of the Chair of Biochemistry

### Module offered by
Chair of Biochemistry

### ECTS
10

### Method of grading
numerical grade

### Only after succ. compl. of module(s)
--

### Duration
1 semester

### Module level
graduate

### Other prerequisites
--

### Contents
This module gives students the opportunity to explore a research topic. Selected methods and topics in molecular biology and biochemistry; cloning, mutagenesis, protein expression and purification, RNA-protein and protein-protein interactions, isolation and functional analysis of macromolecular complexes.

### Intended learning outcomes
The student is able to deeply acquaint himself/herself with a specific research topic, and to present the results in a talk.

### Courses
(type, number of weekly contact hours, language — if other than German)

P (no information on SWS (weekly contact hours) and course language available)

### Method of assessment
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

log (approx. 20 pages) and talk (approx. 15 minutes)

Language of assessment: German or English

### Allocation of places
--

### Additional information
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### Referred to in LPO I (examination regulations for teaching-degree programmes)
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<table>
<thead>
<tr>
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<th>Abbreviation</th>
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<tr>
<td>Practical course &quot;Protein Degradation in Eukaryotes&quot; for advanced students</td>
<td>08-BC-VPPD-102-m01</td>
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<tr>
<td>1 semester</td>
<td>graduate</td>
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</table>

**Contents**

This module gives students the opportunity to explore a research topic in the field of protein degradation in eukaryotes.

**Intended learning outcomes**

The student is able to deeply acquaint himself/herself with a specific research topic, and to present the results in a talk.

**Courses** (type, number of weekly contact hours, language — if other than German)

P (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

log (approx. 20 pages) and talk (approx. 15 minutes)

Language of assessment: German or English

**Allocation of places**

--

**Additional information**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--
### Module title

**Practical course "RNA Biochemistry" for advanced students**

### Abbreviation

08-BC-VPRB-102-m01

### Module coordinator

holder of the Chair of Biochemistry

### Module offered by

Chair of Biochemistry

### ECTS

10

### Method of grading

numerical grade

### Only after succ. compl. of module(s)

--

### Duration

1 semester

### Module level

graduate

### Other prerequisites

--

### Contents

This module gives students the opportunity to explore a research topic in the field of RNA biochemistry. Ribosomes as "molecular machines", regulatory mechanisms of eukaryotic protein biosynthesis. Gradient centrifugation, in vitro translation in different cell-free systems.

### Intended learning outcomes

Students are able to explore a specific research topic and deliver an oral presentation on the results of their work. They are able to familiarise themselves with different mechanisms of general and specific translation control with the help of different methods as well as to present their findings in an appropriate and understandable manner.

### Courses

P (no information on SWS (weekly contact hours) and course language available)

### Method of assessment

log (approx. 20 pages) and talk (approx. 15 minutes)

Language of assessment: German or English

### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

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<th>Module level</th>
<th>Other prerequisites</th>
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<tr>
<td>1 semester</td>
<td>graduate</td>
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**Contents**

This module discusses cloning and the expression of protein constructs for crystallisation. It teaches students the fundamental principles and techniques of crystallisation and crystal optimisation as well as crystallographic data collection.

**Intended learning outcomes**

Students have developed an understanding of the method of selecting protein constructs for crystallisation. They master fundamental skills and techniques for protein crystallisation as well as data collection and processing.

**Courses**

(P no information on SWS (weekly contact hours) and course language available)

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<thead>
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<th>type, number of weekly contact hours, language — if other than German</th>
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**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

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<tbody>
<tr>
<td>log (approx. 20 pages) and talk (approx. 15 minutes) Language of assessment: German or English</td>
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**Allocation of places**

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**Additional information**

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**Referred to in LPO 1** (examination regulations for teaching-degree programmes)

--
### Module title
- **Principles of drug design**

### Abbreviation
- 08-MCM3-102-m01

### Module coordinator
- Lecturers: Pharmazeutische Chemie (Pharmaceutical Chemistry)

### Module offered by
- Institute of Pharmacy and Food Chemistry

### ECTS | Method of grading | Only after succ. compl. of module(s)
---|---|---
5 | numerical grade | --

### Duration | Module level | Other prerequisites
---|---|---
1 semester | graduate | --

### Contents
- Fundamentals: drug targets (types and classification), target validation, effect mechanisms, protein-ligand interactions, lead finding; lead optimisation. Experimental methods: bioassays, HTS, combinatorial chemistry, naturally occurring substances. Theoretical methods: molecular modelling, structure-based drug design, pharmacophore models, docking, virtual screening, simulation methods, de novo design. Ligand-based drug design. QSAR. Predictions of pharmacokinetic and toxicological components (ADME). Case examples, prodrug strategies, bioisosterism, SAR.

### Intended learning outcomes
- The student masters theoretical and experimental methods and aspects of drug design.

### Courses
- **S + Ü** (no information on SWS (weekly contact hours) and course language available)

### Method of assessment
- Type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus

- presentation with discussion (approx. 30 minutes)
- Language of assessment: German or English

### Allocation of places
- Chemistry Master's and Mathematics Master's: no restrictions. Biochemistry Master's: 10 places. Places will be allocated by lot.

### Additional information
- --

### Referred to in LPO I
- (examination regulations for teaching-degree programmes)

<table>
<thead>
<tr>
<th>Module title</th>
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<td>08-PH-KAC-092-m01</td>
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<tr>
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<td>Institute of Pharmacy and Food Chemistry</td>
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</table>

**Contents**

This module covers specific topics of clinical analytical chemistry.

**Intended learning outcomes**

Students have developed an advanced knowledge of molecular biology.

**Courses**

V (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

written examination (120 minutes)

**Allocation of places**

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**Additional information**

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*Referred to in LPO I* (examination regulations for teaching-degree programmes)

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<thead>
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<td>Clinical and Analytical Chemistry (practical course)</td>
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</table>

**Contents**

This module covers practical topics in clinical chemistry and clinical diagnostics as well as the related analytical methods.

**Intended learning outcomes**

Students have developed a knowledge of clinical analytical chemistry and are able to apply it to practical experiments.

**Courses**

(type, number of weekly contact hours, language — if other than German)

P (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

examination talks (Testate, approx. 15 minutes each), log (approx. 5 to 10 pages)

**Allocation of places**

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**Additional information**

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**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

--
Module Catalogue for the Subject Chemistry
Master's with 1 major, 120 ECTS credits

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<table>
<thead>
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<td>Lab Course Materials Science</td>
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<th>Module offered by</th>
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<tbody>
<tr>
<td>lecturers specialisation subject Funktionsmaterialien (Functional Materials)</td>
<td>Chair of Chemical Technology of Material Synthesis</td>
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</table>

Contents
Ten selected experiments in materials science.

Intended learning outcomes
Students have developed an advanced proficiency in the performance of experiments in materials science.

Courses
P (no information on SWS (weekly contact hours) and course language available)

Method of assessment
Vortestate (pre-experiment exams) and Nachtestate (post-experiment exams) (15 minutes), assessment of practical performance, log (5 to 10 pages)
Language of assessment: German or English

Allocation of places
--

Additional information
--

Referred to in LPO I (examination regulations for teaching-degree programmes)
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---
**Module title** | **Abbreviation**  
---|---  
Project Work | 08-FMM-PA-102-m01  

| **Module coordinator** | **Module offered by**  
head of the research group offering the module | Chair of Chemical Technology of Material Synthesis  

| **ECTS** | **Method of grading** | **Only after succ. compl. of module(s)**  
5 | (not) successfully completed | --  

| **Duration** | **Module level** | **Other prerequisites**  
1 semester | graduate | --  

**Contents**  
This module gives students the opportunity to explore a research topic under the guidance of a supervisor and to describe their findings.

**Intended learning outcomes**  
Students have developed an advanced proficiency in the performance of experiments in materials science.

**Courses** (type, number of weekly contact hours, language — if other than German)  
P (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)  
talk (approx. 15 minutes) and log (approx. 15 pages)  
Language of assessment: German or English

**Allocation of places**  
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**Additional information**  
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**Referred to in LPO I** (examination regulations for teaching-degree programmes)  
--
Module title | Abbreviation
--- | ---
Molecular Materials (Lecture) | 08-FMM-CT-102-m01

Module coordinator | Module offered by
--- | ---
Dean of Studies Funktionswerkstoffe (Functional Materials) | Chair of Chemical Technology of Material Synthesis

ECTS | Method of grading | Only after succ. compl. of module(s)
--- | --- | ---
5 | numerical grade | --

Duration | Module level | Other prerequisites
--- | --- | ---
1 semester | graduate | --

Contents
The module imparts the theoretical fundamentals of molecular and soft materials.

Intended learning outcomes
Students have developed a knowledge of the principles of molecular and soft materials and are able to apply that knowledge to research problems.

Courses (type, number of weekly contact hours, language — if other than German)
V + Ü (no information on SWS (weekly contact hours) and course language available)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
presentation (approx. 30 minutes) and a) 1 to 3 written examinations (1 written examination: 90 minutes; 2 written examinations: 60 or 90 minutes each; 3 written examinations: 60 minutes each) or b) oral examination of one candidate each (approx. 20 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes)

Allocation of places
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Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
--
**Module title**

Practical course "Homogeneous catalysis"

**Abbreviation**

08-HKM3-102-m01

**Module coordinator**

Lecturer of the seminar "Spezielle Metallorganische Chemie und deren Anwendung in der Homogenkatalyse"

**Module offered by**

Faculty of Chemistry and Pharmacy

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</table>

**Contents**

This module gives students the opportunity to enhance their skills in advanced synthesis and analytical methods in homogeneous catalysis. The focus will be on catalyst synthesis and characterisation, spectral analysis and crystallography. Students will be expected to conduct their work in the lab independently, write a lab report documenting their findings and deliver a presentation.

**Intended learning outcomes**

Students are able to use advanced synthesis and analytical methods in homogeneous catalysis in the lab and to interpret their findings. They are able to write a lab report documenting their findings and deliver a presentation.

**Courses**

P + P (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

Practical work with lab report (approx. 10 pages) and talk (approx. 15 minutes)

Language of assessment: German or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

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<table>
<thead>
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<td>Advanced transition metal chemistry</td>
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<tbody>
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<td>lecturer of the seminar &quot;Spezielle Übergangsmetallchemie&quot;</td>
<td>Institute of Inorganic Chemistry</td>
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</table>

**Contents**

This module provides students with deeper insights into topics in the chemistry of transition metals and coordination chemistry. It also provides an introduction to bioinorganic chemistry and discusses recent developments in transition metal chemistry.

**Intended learning outcomes**

Students are able to explain transition metals and coordination compounds demonstrating a high degree of expertise in the field. They can explain the fundamental principles of bioinorganic chemistry.

**Courses**

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**Method of assessment**

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<td>a) 1 to 3 written examinations (60 or 90 minutes) or b) oral examination of one candidate each (20 minutes) or c) oral examination in groups (groups of 2, 30 minutes). Should there be the option to choose between several methods of assessment, the module coordinator will choose the method to be used for the module component in the current semester at the beginning of the course. Language of assessment: German or English</td>
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**Allocation of places**

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**Additional information**

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**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

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### Module Catalogue for the Subject Chemistry

#### Master's with 1 major, 120 ECTS credits

<table>
<thead>
<tr>
<th>Module title</th>
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<td>Practical course medicinal chemistry</td>
<td>08-MCM1-102-m01</td>
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<td>lecturers Pharmazeutische Chemie (Pharmaceutical Chemistry)</td>
<td>Institute of Pharmacy and Food Chemistry</td>
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</table>

**Contents**

Selected methods and topics in medicinal chemistry (synthesis, testing, analysis, theory, pharmacokinetics).

**Intended learning outcomes**

Students have developed a knowledge of medicinal chemistry and are able to apply it to practical experiments.

**Courses**

P (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

Vortestate (pre-experiment exams) and Nachtestate (post-experiment exams) (approx. 20 minutes), assessment of practical performance, written report (approx. 30 to 50 pages)

Language of assessment: German or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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<table>
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**Contents**

Chemistry of drugs by field of indication; principles of drug development, strategies for active agent discovery; structure-activity relationships; molecular effect mechanisms; pharmacological principles of the drugs discussed in the module; drug analysis; drug synthesis; biotransformation, pharmacokinetics of individual drugs; history of drug development: discussion of specific examples.

**Intended learning outcomes**

The students acquire knowledge of pharmaceutic/medical chemistry and the according methods of their characterization.

**Courses** (type, number of weekly contact hours, language — if other than German)

V (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

oral examination of one candidate each (approx. 30 minutes)

Language of assessment: German or English

**Allocation of places**

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**Additional information**

--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)

--
### Module title
Supramolecular Chemistry (Practical Course)

### Abbreviation
08-SCM2-102-m01

### Module coordinator
lecturer of lecture "Supramolekularen Chemie (Organische Chemie/Physikalische Chemie)"

### Module offered by
Faculty of Chemistry and Pharmacy

### ECTS
5

### Method of grading
Only after succ. compl. of module(s)

### (not) successfully completed
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### Duration
1 semester

### Module level
graduate

### Other prerequisites
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### Contents
This module gives students the opportunity to perform some of the key experiments in supramolecular chemistry. They will perform syntheses of host-guest complexes, dye aggregates and nanoparticles and use advanced analytical methods to characterise them.

### Intended learning outcomes
Students are able to perform syntheses of host-guest complexes and use spectroscopic methods to analyse and characterise them. They are able to produce nanoparticles and to characterise them microscopically.

### Courses
P (no information on SWS (weekly contact hours) and course language available)

### Method of assessment
practical work, logs (approx. 5 pages each)

Language of assessment: German or English

### Allocation of places
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### Additional information
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### Referred to in LPO I
(examination regulations for teaching-degree programmes)

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<table>
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<td>lecturer of lecture &quot;Programmieren in Theoretischer Chemie&quot;</td>
<td>Institute of Physical and Theoretical Chemistry</td>
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**Contents**

This module provides an introduction to the fundamentals of programming in theoretical chemistry and discusses its application areas.

**Intended learning outcomes**

Students are able to explain and use one of the programming languages typically used in theoretical chemistry as well as to name its application areas.

**Courses** (type, number of weekly contact hours, language — if other than German)

S + Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Completion and discussion of approx. 5 programming exercises as well as talk (approx. 45 minutes)

Language of assessment: German or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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### Module title
Theoretical Chemistry - Project work

### Abbreviation
08-TCAP-102-m01

### Module coordinator
head of the research group offering the module

### Module offered by
Institute of Physical and Theoretical Chemistry

### ECTS
10

### Method of grading
Only after succ. compl. of module(s)

### Duration
1 semester

### Module level
graduate

### Other prerequisites
--

### Contents
This module gives students the opportunity to get involved in the work of one of the research groups based at the Institute of Theoretical Chemistry and learn some of the methods typically used in the discipline.

### Intended learning outcomes
Students have learned some of the methods typically used in theoretical chemistry. They are able to explain issues that are relevant to the fields covered.

### Courses
This module has 3 components; information on courses listed separately for each component.
- **08-TCAP-1-102**: P (no information on language and number of weekly contact hours available)
- **08-TCAP-2-102**: P (no information on language and number of weekly contact hours available)
- **08-TCAP-3-102**: P (no information on language and number of weekly contact hours available)

### Method of assessment
This module has the following 3 assessment components. To pass the module as a whole students must pass two out of these three assessment components.

**Assessment component to module component 08-TCAP-1-102**: Theoretische Chemie Arbeitsgruppenpraktikum Wellenpaketdynamik
- 5 ECTS credits, method of grading: (not) successfully completed
- presentation (approx. 30 minutes)
- Language of assessment: German or English

**Assessment component to module component 08-TCAP-2-102**: Theoretische Chemie Arbeitsgruppenpraktikum Wellenfunktionsmethoden
- 5 ECTS credits, method of grading: (not) successfully completed
- presentation (approx. 30 minutes)
- Language of assessment: German or English

**Assessment component to module component 08-TCAP-3-102**: Theoretische Chemie Arbeitsgruppenpraktikum Dichtefunktionaltheorie
- 5 ECTS credits, method of grading: (not) successfully completed
- presentation (approx. 30 minutes)
- Language of assessment: German or English

### Allocation of places
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### Additional information
Additional information on module duration: 4 weeks...

### Referred to in LPO I
(examination regulations for teaching-degree programmes)

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<table>
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<td>Faculty of Chemistry and Pharmacy</td>
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<th>Method of grading</th>
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<tr>
<th>Duration</th>
<th>Module level</th>
<th>Other prerequisites</th>
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</thead>
<tbody>
<tr>
<td>1 semester</td>
<td>graduate</td>
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</table>

**Contents**

The module offers the opportunity to learn correct presenting and mediating scientific questions by giving a tutorial attendant to a lecture at the faculty of chemistry and pharmacy.

**Intended learning outcomes**

The students are able to adequately prepare and present scientific questions, and to guide students in lower semesters.

**Courses**

<table>
<thead>
<tr>
<th>Type, number of weekly contact hours, language — if other than German</th>
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<td>Ü (no information on SWS (weekly contact hours) and course language available)</td>
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**Method of assessment**

<table>
<thead>
<tr>
<th>Type, scope, language — if other than German, examination offered — If not every semester, information on whether module is creditable for bonus</th>
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</thead>
<tbody>
<tr>
<td>preparation of materials for demonstrations and exercises</td>
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**Allocation of places**

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**Additional information**

--

**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

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<table>
<thead>
<tr>
<th>Module title</th>
<th>Abbreviation</th>
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<tbody>
<tr>
<td>Tutoring 2 (practical course)</td>
<td>08-WRM2-102-m01</td>
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<thead>
<tr>
<th>Module coordinator</th>
<th>Module offered by</th>
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<tbody>
<tr>
<td>Dean of Studies Chemie (Chemistry)</td>
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**Contents**

The module offers the opportunity to learn correct presenting and mediating scientific questions by giving a tutorial attendant to a lecture at the faculty of chemistry and pharmacy.

**Intended learning outcomes**

The students are able to adequately prepare and present scientific questions, and to guide students in lower semesters.

**Courses** (type, number of weekly contact hours, language — if other than German)

Ü (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — If not every semester, information on whether module is creditable for bonus)

preparation of materials for demonstrations and exercises

Language of assessment: German or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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<table>
<thead>
<tr>
<th>Module title</th>
<th>Abbreviation</th>
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<td>Foreign Studies (short)</td>
<td>08-APM1-102-m01</td>
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<tr>
<td>Erasmus programme coordinator Chemie (Chemistry)</td>
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<td>1 semester</td>
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<td>Admission prerequisite to assessment: regular attendance of placement.</td>
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**Contents**

The internship is carried out at universities abroad and can be embedded within offered study programs (e.g. Erasmus). The content requirements should comply with those of the electives of the Chemistry Master program at the University of Würzburg (what has to be ascertained in advance under discussion with the module coordinator).

**Intended learning outcomes**

The students are familiar with working methods at universities abroad. Besides professional competences they have also acquired language and social skills.

**Courses**

P (no information on SWS (weekly contact hours) and course language available)

**Method of assessment**

- report (2 pages); proof of having completed lab course
- Language of assessment: German or English; language of the respective placement country where required

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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<table>
<thead>
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<th>Module title</th>
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<td>Foreign Studies (long)</td>
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**Module coordinator**

Erasmus programme coordinator Chemie (Chemistry)  
Faculty of Chemistry and Pharmacy

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**Duration**  
2 semester  
**Module level**  
graduate

**Contents**

The internship is carried out at universities abroad and can be embedded within offered study programs (eg Erasmus). The content requirements should comply with those of the electives of the Chemistry Master program at the University of Würzburg (what has to be ascertained in advance under discussion with the module coordinator).

**Intended learning outcomes**

The students are familiar with working methods at universities abroad. Besides professional competences they have also acquired language and social skills.

**Courses** (type, number of weekly contact hours, language — if other than German)

P (no information on SWS (weekly contact hours) and course language available)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

report (2 pages); proof of having completed lab course  
Language of assessment: German or English; language of the respective placement country where required

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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Thesis
(30 ECTS credits)
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<th>Module title</th>
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<th>Module level</th>
<th>Other prerequisites</th>
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<tbody>
<tr>
<td>1 semester</td>
<td>graduate</td>
<td>Where applicable, specific modules as specified by supervisor.</td>
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</table>

**Contents**

The module enables the processing of a defined problem within a specified period by applying the scientific methods learned in the course of study.

**Intended learning outcomes**

The student has the ability to deal with a defined problem/issue using scientific methods and to document the results.

**Courses** (type, number of weekly contact hours, language — if other than German)

no courses assigned

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

written thesis

Language of assessment: German or English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I** (examination regulations for teaching-degree programmes)

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