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: 2014
Responsible: Faculty of Chemistry and Pharmacy
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The subject is divided into 8

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- Inorganic Chemistry practical course for advanced

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- Solid state chemistry and inorganic materials
- Advanced organometallic chemistry and its application in homogeneous catalysis

### Organic Chemistry

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- Advanced NMR- and Mass Spectrometry
- Advanced Research Project

#### Compulsory Electives
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- Organic Functional Materials
- Organo- and Biocatalysis
- Supramolecular Chemistry (Basics)
- Bioorganic Chemistry
- Computational Chemistry

### Physical Chemistry

#### Compulsory Courses
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- Advanced Physical Chemistry (Lab)

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- Ultrafast spectroscopy and quantumcontrol
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Bioanorganic Chemistry
Solid state chemistry and inorganic materials
Modern Synthetic Methods
Advanced NMR- and Mass Spectrometry
Modern Aspects of Natural Product Chemistry and Biological Chemistry
Organic Functional Materials
Ultrafast spectroscopy and quantum control
Physical chemistry of supramolecular assemblies
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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)):

19-Feb-2014 (2014-1)

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)
Compulsory Electives Focuses

(75 ECTS credits)

Students must choose three focuses with 25 ECTS credits each.
Inorganic Chemistry

(25 ECTS credits)
Compulsory Courses
(20 ECTS credits)
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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.

**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.

**Courses**

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

S + 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) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, English

**Allocation of places**

--

**Additional information**

--

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

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**Contents**

This module 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 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**

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

**Method of assessment**

practical work with lab report (approx. 20 pages) and talk (approx. 15 minutes)

Language of assessment: German or English

**Allocation of places**

--

**Additional information**

Additional information on module duration: block placement with a duration of a minimum of 40 working days.

**Referred to in LPO I**

(examination regulations for teaching-degree programmes)
Compulsory Electives

(5 ECTS credits)
### Module Catalogue for the Subject Chemistry

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

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<td>lecturer of seminar &quot;Anorganische Aspekte der Biochemie and Medizinischen Chemie&quot; (Inorganic Aspects of Biochemistry and Medicinal Chemistry)</td>
<td>Institute of Inorganic Chemistry</td>
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<tr>
<td>1 semester</td>
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### 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

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

### Method of assessment

a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, 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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### Solid state chemistry and inorganic materials

<table>
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<td>Solid state chemistry and inorganic materials</td>
<td>08-ACM3-141-m01</td>
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<tr>
<td>lecturer of seminar &quot;Festkörperchemie and Anorganische Materialien&quot; (Solid State Chemistry and Inorganic Materials)</td>
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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**

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

**Method of assessment**

a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, 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
Advanced organometallic chemistry and its application in homogeneous catalysis

### Abbreviation
08-HKM2-141-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)

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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) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, 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)

--
Organic Chemistry

(25 ECTS credits)
Compulsory Courses

(15 ECTS credits)
Module title | Abbreviation
--- | ---
Modern Synthetic Methods | 08-OCM-SYNT-141-m01

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

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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) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, 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>Advanced NMR- and Mass Spectrometry</td>
<td>08-OCM-NMRMS-141-m01</td>
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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

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

### Method of assessment

- a) written examination (approx. 90 to 180 minutes) or
- b) oral examination of one candidate each (approx. 20 to 30 minutes) or
- c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or
- d) log (approx. 20 pages) or
- e) presentation (approx. 30 minutes).

Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, 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>head of the research group offering the module</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**

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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
(10 ECTS credits)
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<td>Modern Aspects of Natural Product Chemistry and Biological Chemistry</td>
<td>08-OCM-NAT-141-m01</td>
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<td>lecturer of the seminar</td>
<td>Institute of Organic Chemistry</td>
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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** (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) written examination (approx. 90 to 180 minutes) or
- b) oral examination of one candidate each (approx. 20 to 30 minutes) or
- c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or
- d) log (approx. 20 pages) or
- e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, English

**Allocation of places**

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

**Additional information**

--

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

--
### Module title
Organic Functional Materials

### Abbreviation
08-OCM-FM-141-m01

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

### Module offered by
Institute of Organic 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 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
(S: no information on SWS (weekly contact hours) and course language available)

### Method of assessment
(a) written examination (approx. 90 to 180 minutes) or (b) oral examination of one candidate each (approx. 20 to 30 minutes) or (c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or (d) log (approx. 20 pages) or (e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, 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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**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**

(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) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, English

**Allocation of places**

--

**Additional information**

--

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

--
Supramolecular Chemistry (Basics)  
08-SCM1-102-m01

Module coordinator  
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)
--
Module title: Bioorganic Chemistry
Abbreviation: 08-SCM3-141-m01

Module coordinator: Lecturer of lecture "Bioorganische Chemie" (Bioorganic Chemistry)
Module offered by: Institute of Organic 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 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) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.
Language of assessment: German, English

Allocation of places:
--

Additional information:
--

Referred to in LPO I (examination regulations for teaching-degree programmes):
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Module title | Abbreviation
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Computational Chemistry | 08-TCM2-141-m01

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

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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)
a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.
Language of assessment: German, 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)
--
Physical Chemistry
(25 ECTS credits)
Compulsory Courses

(10 ECTS credits)
### Module title
- Laser Spectroscopy

### Abbreviation
- 08-PCM1a-132-m01

### Module coordinator
- Lecturer of seminar "Laserspektroskopie" (Laser Spectroscopy)

### 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 introduces students to the fundamental principles of laser spectroscopy. It discusses absorption and emission spectroscopy.

### 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.

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

### Method of assessment
- Written examination (90 minutes) or oral examination (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 | Abbreviation
--- | ---
Advanced Physical Chemistry (Lab) | 08-PCM1b-132-m01

| Module coordinator | Module offered by |
--- | ---
lector of seminar "Laserspektroskopie" (Laser Spectroscopy) | Institute of Physical and Theoretical Chemistry

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

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

**Contents**

This 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 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**

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

Language of assessment: German or English

**Allocation of places**

--

**Additional information**

Additional information on module duration: block placement with a duration of a minimum of 20 working days.

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

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Compulsory Electives

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<td>Institute of Physical and Theoretical Chemistry</td>
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</tr>
</thead>
<tbody>
<tr>
<td>1 semester</td>
<td>graduate</td>
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</tbody>
</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

<table>
<thead>
<tr>
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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>written examination (90 minutes) or oral examination of one candidate each (20 minutes) or talk (30 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 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>Nanoscale Materials</td>
<td>08-PCM3-102-m01</td>
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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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</thead>
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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**

- 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**

- --

**Additional information**

- --

**Referred to in LPO I**

- (examination regulations for teaching-degree programmes)
Module title: Ultrafast spectroscopy and quantum control
Abbreviation: 08-PCM4-141-m01

Module coordinator: Lecturer of the seminar "Ultrakurzzeitspektroskopie und 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: Prior successful completion of modules 08-PCM1a and 08-PCM1b is highly recommended.

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 (approx. 90 minutes) or oral examination of one candidate each (approx. 20 minutes) or talk (approx. 30 minutes)
Language of assessment: German, 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>Physical chemistry of supramolecular assemblies</td>
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<td>lecturer of the seminar &quot;Physikalische Chemie Supramole-</td>
<td>Institute of Physical and Theoretical Chemi</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 (approx. 90 minutes) or oral examination of one candidate each (approx. 20 minutes) or talk (approx. 30 minutes)

Language of assessment: German, 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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### 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 (approx. 20 minutes)
- Language of assessment: German or English

### Allocation of places

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### Additional information

Additional information on module duration: block placement with a duration of a minimum of 20 working days.

### Referred to in LPO I

(examination regulations for teaching-degree programmes)

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<td>Theoretical Chemistry (Basics)</td>
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<td>graduate</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)

a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, 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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<tbody>
<tr>
<td>lecturer of lecture &quot;Computational Chemistry&quot;</td>
<td>Institute of Physical and Theoretical Chemistry</td>
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<td>graduate</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)

a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, English

**Allocation of places**

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**Additional information**

--

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

--
Biochemistry
(25 ECTS credits)

Students are highly recommended to consult with course advisory service prior to choosing this focus.
Compulsory Courses
(15 ECTS credits)
**Module title**  |  Molecular Biology
---|---
**Abbreviation**  |  08-BC-MOLM-141-m01

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

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

**Contents**
The module covers specific topics of molecular physiology and functional biochemistry in lectures and exercise.

**Intended learning outcomes**
Students have developed a sound knowledge of molecular biology.

**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)

a) written examination (approx. 60 to 90 minutes) or b) log (approx. 20 pages) or c) oral examination of one candidate each (approx. 20 minutes) or d) oral examination in groups of up to 3 candidates (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) presentation (approx. 30 minutes). Students will be informed about the method and length of the assessment prior to 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 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>Molecular Biology Lab</td>
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<tbody>
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<tbody>
<tr>
<td>1 semester</td>
<td>undergraduate</td>
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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

<table>
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### Method of assessment

- a) written examination (approx. 60 to 90 minutes)
- b) log (approx. 20 pages)
- c) oral examination of one candidate each (approx. 20 minutes)
- d) oral examination in groups of up to 3 candidates (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes)
- e) presentation (approx. 30 minutes)

Students will be informed about the method and length of the assessment prior to the course.

Assessment offered: once a year, winter semester

Language of assessment: German, English

### Allocation of places

- Biochemistry Bachelor's: 24 places
- Chemistry Master's: 6 places

### Additional information

- --

### Referred to in LPO I

(examination regulations for teaching-degree programmes)

- --
Compulsory Electives
(10 ECTS credits)
### Module title

**Practical course Molecular Machines for advanced students**

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<table>
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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. 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, English

### Allocation of places

--

### Additional information

Additional information on module duration: block placement with a duration of a minimum of 40 working days.

*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>Practical course Protein Degradation in Eukaryotes for advanced students</td>
<td>08-BC-VPPD-141-m01</td>
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#### Module coordinator
holder of the Chair of Biochemistry

#### Module offered by
Chair of Biochemistry

<table>
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<tbody>
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</tbody>
</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 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
<table>
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<th>language — if other than German</th>
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### Method of assessment
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<th>examination offered — if not every semester, information on whether module is creditable for bonus</th>
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### Language of assessment
German, English

### Allocation of places
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### Additional information
Additional information on module duration: block placement with a duration of a minimum of 40 working days.

### 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>
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<th>Module title</th>
<th>Abbreviation</th>
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<tbody>
<tr>
<td>Practical course RNA Biochemistry for advanced students</td>
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<tbody>
<tr>
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<td>graduate</td>
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</table>

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, English)

Allocation of places

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Additional information

Additional information on module duration: block placement with a duration of a minimum of 40 working days.

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

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<table>
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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)

**Method of assessment**

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

Language of assessment: German, English

**Allocation of places**

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**Additional information**

Additional information on module duration: block placement with a duration of a minimum of 40 working days.

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

--
Bioanorganic Chemistry

08-ACM2-141-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

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

Method of assessment

A) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, 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)
<table>
<thead>
<tr>
<th>Module title</th>
<th>Abbreviation</th>
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<tbody>
<tr>
<td>Organo- and Biocatalysis</td>
<td>08-HKM1-141-m01</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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<tr>
<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) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, 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
Modern Aspects of Natural Product Chemistry and Biological Chemistry

Abbreviation
08-OCM-NAT-141-m01

Module coordinator
Lecturer of the seminar

Module offered by
Institute of Organic Chemistry

ECTS
5

Method of grading
Numerical grade

Only after successful completion of module(s)
--

Duration
1 semester

Module level
Graduate

Other prerequisites
--

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
(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) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.
Language of assessment: German, 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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### Module title

**Principles of drug design**

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<td>Principles of drug design</td>
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#### Module coordinator

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<td>Pharmazeutische Chemie (Pharmaceutical Chemistry)</td>
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#### ECTS

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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

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### Method of assessment

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<td>presentation with discussion (approx. 30 minutes)</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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<tr>
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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**

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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**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)

--
Functional Materials

(25 ECTS credits)
Compulsory Courses
(20 ECTS credits)
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<td>lecturers specialisation subject Funktionsmaterialien (Functional Materials)</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**

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**

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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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**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**

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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>Organic Functional Materials</td>
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<td>lecturer of the seminar &quot;Organische Funktionsmaterialien&quot;</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) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, 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>Chair of Chemical Technology of Material Synthesis</td>
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<table>
<thead>
<tr>
<th>Contents</th>
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<tbody>
<tr>
<td>This module discusses the fundamental relations between chemical bonding, the structure, the microstructure and the properties of materials.</td>
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<table>
<thead>
<tr>
<th>Intended learning outcomes</th>
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</thead>
<tbody>
<tr>
<td>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.</td>
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Compulsory Electives
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<td><strong>Material Sciences 2 (Materials)</strong></td>
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**Module coordinator**

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

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<td>undergraduate</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**

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

a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, 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>Chemically and bio-inspired Nanotechnology for 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** (type, number of weekly contact hours, language — if other than German)

V + 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)

a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

**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>Molecular Materials (Lecture)</td>
<td>08-FMM-CT-141-m01</td>
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<tr>
<td>Dean of Studies Funktionswerkstoffe (Functional Materials)</td>
<td>Chair of Chemical Technology of Material Synthesis</td>
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**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 examination

**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
Polymer Chemistry

### Abbreviation
03-FU-PM1-141-m01

### Module coordinator
holder of the Chair of Functional Materials in Medicine and Dentistry

### Module offered by
Faculty of Medicine

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### Contents
Basic methods of polymerisation: free radical polymerisations, polyadditions, ionic polymerisations, controlled radical polymerisations; characterisation of polymers and polymer analytics: gel permeation chromatography, endgroup analysis, mass spectrometry, rheology.

### Intended learning outcomes
The students are familiar with the fundamentals of polymer chemistry and the related methods for their characterisation.

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

- 03-FU-PM1-1-141: V (no information on SWS (weekly contact hours) and course language available)
- 03-FU-PM1-2-122: 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 03-FU-PM1-1-141: Polymer Chemistry (Lecture)
- 3 ECTS, Method of grading: numerical grade
- a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

#### Assessment in module component 03-FU-PM1-2-122: Polymer Chemistry (Practical course)
- 2 ECTS, Method of grading: (not) successfully completed
- Vorstestate (pre-experiment exams, approx. 15 minutes each) and logs (approx. 5 pages each)
- Assessment offered: once a year, summer semester
- Language of assessment: German, English if agreed upon with the examiner

### 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**

In-depth knowledge and practical application of: - free radical polymerisation, polyaddition - ionic polymerisations - controlled radical polymerisation - polymer characterisation (e.g. gel permeation chromatography, end-group analysis, mass spectrometry) - current aspects of polymer research (e.g. block-copolymers, polymer topographies, polymer functionalisation).

**Intended learning outcomes**

Students acquire an advanced knowledge of polymer synthesis, modification and characterisation.

**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) written examination (approx. 90 minutes) or b) oral examination of one candidate each (20 minutes) or c) 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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<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)

--
Module title | Abbreviation
---|---
Supramolecular Chemistry (Basics) | 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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<td>lecturer of seminar &quot;Festkörperchemie und Anorganische Materialien&quot; (Solid State Chemistry and Inorganic Materials)</td>
<td>Institute of Inorganic Chemistry</td>
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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**

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

**Method of assessment**

a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, 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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Homogeneous Catalysis
(25 ECTS credits)
Compulsory Courses

(20 ECTS credits)
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<td>Organo- and Biocatalysis</td>
<td>08-HKM1-141-m01</td>
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<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**

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

**Method of assessment**

a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, English

**Allocation of places**

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**Additional information**

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<td>Advanced organometallic chemistry and its application in homogeneous catalysis</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)
5 (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) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, English

### Allocation of places
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### Additional information
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**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**  
(no information on SWS (weekly contact hours) and course language available)

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

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

**Allocation of places**

--

**Additional information**

Additional information on module duration: block placement with a duration of a minimum of 20 working days.

**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>
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<th>Module title</th>
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### 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

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### Method of assessment

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| 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

Additional information on module duration: block placement with a duration of a minimum of 20 working days.

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

(5 ECTS credits)
Advanced transition metal chemistry

Module title

08-HKM4-141-m01

Abbreviation

Module coordinator

I lecture of the seminar "Spezielle Übergangsmetalchemie" of the seminar "Spezielle Übergangsmetalchemie"

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

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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

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

Method of assessment

a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, 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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### 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

- **Module offered by:** Institute of Physical and Theoretical Chemistry

### Method of assessment

- **Type:** written examination (90 minutes) or oral examination of one candidate each (20 minutes) or talk (30 minutes)
- **Scope:** Language of assessment: German or English
- **Language:** German or English
- **Allocation of places:** --
- **Additional information:** --
- **Referred to in LPO I** (examination regulations for teaching-degree programmes)
Module title
Modern Synthetic Methods

Abbreviation
08-OCM-SYNT-141-m01

Module coordinator
Lecturer of the seminar

Module offered by
Institute of Organic Chemistry

ECTS
5

Method of grading
Numerical grade

Only after successful completion of module(s)

Duration
1 semester

Module level
Graduate

Other prerequisites
--

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) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, 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>
<td>08-TCM2-141-m01</td>
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<td>lecturer of lecture &quot;Computational Chemistry&quot;</td>
<td>Institute of Physical and Theoretical Chemistry</td>
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**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**

(a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, 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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**Contents**

Basic methods of polymerisation: free radical polymerisations, polyadditions, ionic polymerisations, controlled radical polymerisations; characterisation of polymers and polymer analytics: gel permeation chromatography, endgroup analysis, mass spectrometry, rheology.

**Intended learning outcomes**

The students are familiar with the fundamentals of polymer chemistry and the related methods for their characterisation.

**Courses**

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

- 03-FU-PM1-1-141: V (no information on SWS (weekly contact hours) and course language available)
- 03-FU-PM1-2-122: 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 03-FU-PM1-1-141: Polymer Chemistry (Lecture)**

- 3 ECTS, Method of grading: numerical grade
- a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

**Assessment in module component 03-FU-PM1-2-122: Polymer Chemistry (Practical course)**

- 2 ECTS, Method of grading: (not) successfully completed
- Vortestate (pre-experiment exams, approx. 15 minutes each) and logs (approx. 5 pages each)
- Assessment offered: once a year, summer semester
- Language of assessment: German, English if agreed upon with the examiner

**Allocation of places**

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**Additional information**

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

--
Medicinal Chemistry
(25 ECTS credits)
Compulsory Courses

(25 ECTS credits)
### Module Catalogue for the Subject
Chemistry

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

<table>
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**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)

--
Module title | Abbreviation
---|---
Pharmaceutical/Medicinal Chemistry 1 | 08-MCM2a-141-m01

Module coordinator | Module offered by
---|---
lecturers Pharmazeutische Chemie (Pharmaceutical Chemistry) | Institute of Pharmacy and Food Chemistry

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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 (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)

a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

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
- Pharmaceutical/Medicinal Chemistry 2

### Abbreviation
- 08-MCM2b-141-m01

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

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

### ECTS
- 5

### Method of grading
- Numerical grade

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

### Duration
- 1 semester

### Module level
- Graduate

### Other prerequisites
- --

### 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)
  - a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes).
  - Students will be informed about the type and length of assessment prior to the course.

### Allocation of places
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### Additional information
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### Referred to in LPO 1
- (examination regulations for teaching-degree programmes)
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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**

--

**Additional information**

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**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

### ECTS

5

### Method of grading

Numerical grade

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

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### Duration

1 semester

### Module level

Graduate

### Other prerequisites

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### 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

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

**S**

### 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 1

(examination regulations for teaching-degree programmes)

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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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### 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
(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) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, 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
(15 ECTS credits)

No less than one of the two modules 08-SCM3 or 08-PCM5 must be completed in the focus.
### Module title
Bioorganic Chemistry

| Abbreviation | 08-SCM3-141-m01 |

### Module coordinator
lecturer of lecture "Bioorganische Chemie" (Bioorganic Chemistry)

### Module offered by
Institute of Organic Chemistry

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

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Language of assessment: German, English

### Allocation of places
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### Additional information
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**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 (approx. 90 minutes) or oral examination of one candidate each (approx. 20 minutes) or talk (approx. 30 minutes)

Language of assessment: German, 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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**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) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, English

**Allocation of places**

--

**Additional information**

--

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

--
Module title: Principles of drug design
Abbreviation: 08-MCM3-132-m01

Module coordinator: Pharmazeutische Chemie (Pharmaceutical Chemistry)
Module offered by: Institute of Pharmacy and Food Chemistry

ECTS: 5
Method of grading: numerical grade
Duration: 1 semester
Module level: graduate
Other prerequisites: --

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: --

Additional information: --

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

### Abbreviation
08-TCM2-141-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
--

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

a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, English

### Allocation of places
--

### Additional information
--

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

--
### Module title
Organic Functional Materials

### Abbreviation
08-OCM-FM-141-m01

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

### Module offered by
Institute of Organic 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 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
No information on SWS (weekly contact hours) and course language available.

### Method of assessment
- a) written examination (approx. 90 to 180 minutes)
- b) oral examination of one candidate each (approx. 20 to 30 minutes)
- c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes)
- d) log (approx. 20 pages)
- e) presentation (approx. 30 minutes)

Language of assessment: German, 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 the seminar &quot;Nanoskalige Materialien&quot;</td>
<td>Institute of Physical and Theoretical Chemistry</td>
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<td>1 semester</td>
<td>graduate</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**

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**

--

**Additional information**

--

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

--
Theoretical Chemistry
(25 ECTS credits)
Compulsory Courses

(10 ECTS credits)
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<th>Module title</th>
<th>Abbreviation</th>
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<td>08-TCM1-141-m01</td>
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<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

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)

a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, 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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<td>08-TCM3-102-m01</td>
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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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<td>1 semester</td>
<td>graduate</td>
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</table>

**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**

--

**Additional information**

--

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

--
Compulsory Electives
(15 ECTS credits)

Two of the three modules 08-TCAP1, 08-TCAP2 and 08-TCAP3 must be taken.
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<th>Abbreviation</th>
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<td>08-TCM2-141-m01</td>
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<td>lecturer of lecture &quot;Computational Chemistry&quot;</td>
<td>Institute of Physical and Theoretical Chemistry</td>
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### 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

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### Method of assessment

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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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<tr>
<td>Module title</td>
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<tr>
<td>Theoretical Chemistry - Project course wave-packet dynamics</td>
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<th>Module coordinator</th>
<th>Module offered by</th>
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<tbody>
<tr>
<td>head of the research group offering the module</td>
<td>Institute of Physical and Theoretical Chemistry</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 Theoretical Chemistry and learn some of the methods typically used in the discipline. The focus will be on wave packet dynamics.

**Intended learning outcomes**

Students have learned some of the methods typically used in theoretical chemistry and, in particular, in wave packet dynamics. They are able to explain issues that are relevant to the field of wave packet dynamics.

**Courses**

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

**Method of assessment**

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

**Allocation of places**

--

**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>
<thead>
<tr>
<th>Module title</th>
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<td>Theoretical Chemistry - Project course wave function based methods</td>
<td>08-TCAP2-132-m01</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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<tr>
<td>1 semester</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 Theoretical Chemistry and learn some of the methods typically used in the discipline. The focus will be on wave function methods.

**Intended learning outcomes**

Students have learned some of the methods typically used in theoretical chemistry and, in particular, in wave function methods. They are able to explain issues that are relevant to the field of wave function methods.

**Courses**

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

**Method of assessment**

presentation (approx. 30 minutes)

Language of assessment: German or English

**Allocation of places**

--

**Additional information**

Additional information on module duration: 4 weeks.

**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

--
### Module title

Theoretical Chemistry - Project course Computational Photochemistry

### Abbreviation

08-TCAP3-132-m01

### Module coordinator

head of the research group offering the module

### Module offered by

Institute of Physical and Theoretical Chemistry

### ECTS

5

### 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. The focus will be on theoretical photochemistry.

### Intended learning outcomes

Students have learned some of the methods typically used in theoretical chemistry and, in particular, in theoretical photochemistry. They are able to explain issues that are relevant to the field of theoretical photochemistry.

### Courses

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

### Method of assessment

presentation (approx. 30 minutes)

Language of assessment: German or English

### Allocation of places

--

### Additional information

Additional information on module duration: 4 weeks.

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

--
### Module title
Principles of drug design

### Abbreviation
08-MCM3-132-m01

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

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

### ECTS
5

### Method of grading
Numerical grade

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

### Duration
1 semester

### Module level
Graduate

### Other prerequisites
--

### 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
--

### Additional information
--

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

--
Additional qualifications

(15 ECTS credits)
Additional qualifications Compulsory Electives Focuses
(5 ECTS credits)

Module from the Focuses (Schwerpunkte) area of mandatory electives that has not been used as part of a focus subject.
<table>
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<tr>
<td>Managing Director of the Institute of Inorganic Chemistry</td>
<td>Institute of Inorganic Chemistry</td>
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### 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.

### 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.

### Courses

<table>
<thead>
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### Method of assessment

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<td>Language of assessment: German, English</td>
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### Allocation of places

--

### Additional information

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### Referred to in LPO 1

(examination regulations for teaching-degree programmes)

--
# Module Catalogue for the Subject Chemistry

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

### Module title

<table>
<thead>
<tr>
<th>Bioanorganic Chemistry</th>
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</thead>
</table>

### Abbreviation

| 08-ACM2-141-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

| (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) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course. Language of assessment: German, 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-ACM3-141-m01

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

### Module offered by
Institute of Inorganic Chemistry

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<th>Only after succ. compl. of module(s)</th>
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<th>Other prerequisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 semester</td>
<td>graduate</td>
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</table>

### 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) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, 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>Modern Synthetic Methods</td>
<td>08-OCM-SYNT-141-m01</td>
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<th>Module offered by</th>
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<tr>
<td>lecturer of the seminar</td>
<td>Institute of Organic Chemistry</td>
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<tr>
<td>1 semester</td>
<td>graduate</td>
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</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

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

### Method of assessment

(a) written examination (approx. 90 to 180 minutes) or (b) oral examination of one candidate each (approx. 20 to 30 minutes) or (c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or (d) log (approx. 20 pages) or (e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, 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
Advanced NMR- and Mass Spectrometry

## Abbreviation
08-OCM-NMRMS-141-m01

## Module coordinator
lab course supervisor

## Module offered by
Institute of Organic Chemistry

## ECTS
5

## Method of grading
numerical grade

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

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e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, English

### Allocation of places
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### Additional information
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(examination regulations for teaching-degree programmes)
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<tr>
<td>Modern Aspects of Natural Product Chemistry and Biological Chemistry</td>
<td>08-OCM-NAT-141-m01</td>
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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 (no information on SWS (weekly contact hours) and course language available)

Method of assessment

a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, 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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### 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>Organic Functional Materials</td>
<td>08-OCM-FM-141-m01</td>
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<tbody>
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<td>lecturer of the seminar &quot;Organische Funktionsmaterialien&quot;</td>
<td>Institute of Organic Chemistry</td>
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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>
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<th>Type</th>
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### Method of assessment

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Language of assessment: German, 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>Ultrafast spectroscopy and quantum control</td>
<td>08-PCM4-141-m01</td>
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<tbody>
<tr>
<td>lecturer of the seminar &quot;Ultrakurzzeitspektroskopie und Quantenkontrolle&quot;</td>
<td>Institute of Physical and Theoretical Chemistry</td>
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<tr>
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<td>graduate</td>
<td>Prior successful completion of modules 08-PCM1a and 08-PCM1b is highly recommended.</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

- S + Ü (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) or talk (approx. 30 minutes)
- Language of assessment: German, 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
Physical chemistry of supramolecular assemblies

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>08-PCM5-141-m01</th>
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<th>Module coordinator</th>
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<tbody>
<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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<td>1 semester</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
S + Ü (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) or talk (approx. 30 minutes)
Language of assessment: German, 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 title</th>
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<tbody>
<tr>
<td>Molecular Biology</td>
<td>08-BC-MOLM-141-m01</td>
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**Module coordinator**
holder of the Chair of Biochemistry

**Module offered by**
Chair of Biochemistry

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

**Method of assessment**
(a) written examination (approx. 60 to 90 minutes) or (b) log (approx. 20 pages) or (c) oral examination of one candidate each (approx. 20 minutes) or (d) oral examination in groups of up to 3 candidates (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or (d) presentation (approx. 30 minutes). Students will be informed about the method and length of the assessment prior to 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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<thead>
<tr>
<th>Module title</th>
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<tbody>
<tr>
<td>Molecular Biology Lab</td>
<td>08-BC-MOLP-141-m01</td>
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<th>Module coordinator</th>
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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

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

a) written examination (approx. 60 to 90 minutes) or b) log (approx. 20 pages) or c) oral examination of one candidate each (approx. 20 minutes) or d) oral examination in groups of up to 3 candidates (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or e) presentation (approx. 30 minutes). Students will be informed about the method and length of the assessment prior to the course.

Assessment offered: once a year, winter semester

Language of assessment: German, English

### Allocation of places


### Additional information

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### Referred to in LPO I

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<table>
<thead>
<tr>
<th>Module title</th>
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<tbody>
<tr>
<td>Practical course Molecular Machines for advanced students</td>
<td>08-BC-VPMM-141-m01</td>
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</table>

**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, English

**Allocation of places**

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**Additional information**

Additional information on module duration: block placement with a duration of a minimum of 40 working days.

**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>Practical course Protein Degradation in Eukaryotes for advanced students</td>
<td>08-BC-VPPD-141-m01</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, English

**Allocation of places**

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**Additional information**

Additional information on module duration: block placement with a duration of a minimum of 40 working days.

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

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<thead>
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<th>Module title</th>
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<tr>
<td>Practical course RNA Biochemistry for advanced students</td>
<td>08-BC-VPRB-141-m01</td>
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</table>

**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, English

**Allocation of places**

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**Additional information**

Additional information on module duration: block placement with a duration of a minimum of 40 working days.

**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

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<table>
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<td>Practical course Structural Biology for advanced students</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)

**Method of assessment**

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

Language of assessment: German, English

**Allocation of places**

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**Additional information**

Additional information on module duration: block placement with a duration of a minimum of 40 working days.

**Referred to in LPO I**

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<td>Material Sciences 2 (Materials)</td>
<td>08-FS2-141-m01</td>
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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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</thead>
<tbody>
<tr>
<td>1 semester</td>
<td>undergraduate</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

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

### Method of assessment

(a) written examination (approx. 90 to 180 minutes) or (b) oral examination of one candidate each (approx. 20 to 30 minutes) or (c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or (d) log (approx. 20 pages) or (e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, 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>Chemically and bio-inspired Nanotechnology for Material Synthesis</td>
<td>08-NTM-141-m01</td>
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<tbody>
<tr>
<td>holder of the Chair of Chemical Technology of Material Synthesis</td>
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</table>

**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**

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

**Method of assessment**

a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

**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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<thead>
<tr>
<th>Module title</th>
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<td>Molecular Materials (Lecture)</td>
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<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

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

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<td>presentation (approx. 30 minutes) and examination</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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<td>Polymer Chemistry</td>
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<tr>
<td>holder of the Chair of Functional Materials in Medicine</td>
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<td>and Dentistry</td>
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**Contents**

Basic methods of polymerisation: free radical polymerisations, polyadditions, ionic polymerisations, controlled radical polymerisations; characterisation of polymers and polymer analytics: gel permeation chromatography, endgroup analysis, mass spectrometry, rheology.

**Intended learning outcomes**

The students are familiar with the fundamentals of polymer chemistry and the related methods for their characterisation.

**Courses**

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

- 03-FU-PM1-1-141: V (no information on SWS (weekly contact hours) and course language available)
- 03-FU-PM1-2-122: 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 03-FU-PM1-1-141: Polymer Chemistry (Lecture)**

- 3 ECTS, Method of grading: numerical grade
- a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

**Assessment in module component 03-FU-PM1-2-122: Polymer Chemistry (Practical course)**

- 2 ECTS, Method of grading: (not) successfully completed
- Vortestate (pre-experiment exams, approx. 15 minutes each) and logs (approx. 5 pages each)
- Assessment offered: once a year, summer semester
- Language of assessment: German, English if agreed upon with the examiner

**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
Organo- and Biocatalysis

Abbreviation
08-HKM1-141-m01

Module coordinator
I. lecturer of the seminar "Organo- and Biokatalyse"

Module offered by
Institute of Organic 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 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) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.
Language of assessment: German, 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>Advanced organometallic chemistry and its application in homogeneous catalysis</td>
<td>08-HKM2-141-m01</td>
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<table>
<thead>
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<tbody>
<tr>
<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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<tr>
<td>1 semester</td>
<td>graduate</td>
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</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

(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) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, 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: Advanced transition metal chemistry

**Abbreviation:** 08-HKM4-141-m01

**Module coordinator:** Lecturer of the seminar "Spezielle Übergangsmetallchemie"

**Module offered by:** Institute of Inorganic Chemistry

**ECTS:** 5

**Method of grading:** Numerical grade

**Duration:** 1 semester

**Module level:** Graduate

**Other prerequisites:** --

### 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

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

### Method of assessment

(a) written examination (approx. 90 to 180 minutes) or (b) oral examination of one candidate each (approx. 20 to 30 minutes) or (c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or (d) log (approx. 20 pages) or (e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, 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)

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# Module Catalogue for the Subject Chemistry

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

## Module title

<table>
<thead>
<tr>
<th>Pharmaceutical/Medicinal Chemistry 1</th>
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<tr>
<td>o8-MCM2a-141-m01</td>
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## Module coordinator

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<th>Lecturers</th>
<th>Module offered by</th>
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</thead>
<tbody>
<tr>
<td>Pharmazeutische Chemie (Pharmaceutical Chemistry)</td>
<td>Institute of Pharmacy and Food Chemistry</td>
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</table>

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

| 5 | numerical grade | -- |

## Duration Module level Other prerequisites

| 1 semester | graduate | -- |

## 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

| a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course. |

## 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

<table>
<thead>
<tr>
<th>Module title</th>
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<tr>
<td>Pharmaceutical/Medicinal Chemistry 2</td>
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### Module coordinator
- Lecturers: Pharmazeutische Chemie (Pharmaceutical Chemistry)
- Institute of Pharmacy and Food Chemistry

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</table>

### Duration
- 1 semester
- Graduate

### Other prerequisites
- --

### 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
(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 (approx. 90 to 180 minutes)
2. Oral examination of one candidate each (approx. 20 to 30 minutes)
3. Oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes)
4. Log (approx. 20 pages)
5. Presentation (approx. 30 minutes)

Students will be informed about the type and length of assessment prior to the course.

### Allocation of places
- --

### Additional information
- --

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

Bioorganic Chemistry  

### Abbreviation

08-SCM3-141-m01

### Module coordinator

Lecturer of lecture "Bioorganische Chemie" (Bioorganic Chemistry)

### Module offered by

Institute of Organic Chemistry

### ECTS

<table>
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<tbody>
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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

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### Method of assessment

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Language of assessment: German, 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>Theoretical Chemistry (Basics)</td>
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<td>lecturer of lecture &quot;Theoretische Chemie&quot;</td>
<td>Institute of Physical and Theoretical Chemistry</td>
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</table>

**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)

a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, 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>Computational Chemistry</td>
<td>08-TCM2-141-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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</table>

**Duration**

1 semester

**Module level**

graduate

**Other prerequisites**

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**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)

a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, 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
Material Sciences 1 (Principles)

Abbreviation
08-FS1-141-m01

Module coordinator
Dean of Studies Funktionswerkstoffe (Functional Materials)
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 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 (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)
a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.
Language of assessment: German, 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: Lecturer of lecture "Organischen Chemie"
Module offered by: Faculty of Chemistry and Pharmacy

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 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

Chemical Dynamics

### Abbreviation

08-PCM2-102-m01

### Module coordinator

I lecturers of seminar "Chemische Dynamik" (Chemical Dynamics)

### Module offered by

Institute of Physical and Theoretical Chemistry

### ECTS

<table>
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<tbody>
<tr>
<td>1 semester</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 chemical reactions.

### Courses

<table>
<thead>
<tr>
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<th>Language</th>
<th>Other information</th>
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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) --
## Module title
Nanoscale Materials

## Abbreviation
08-PCM3-102-m01

### Module coordinator
Lecturer of the seminar "Nanoskalige Materialien"

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

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### Duration
1 semester

### Module level
graduate

### Other prerequisites
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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
(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>Clinical and Analytical Chemistry</td>
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<tr>
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<td>undergraduate</td>
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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**

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

**Method of assessment**

written examination (120 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**

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<thead>
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<td>Clinical and Analytical Chemistry (practical course)</td>
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<td>Institute of Pharmacy and Food Chemistry</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

<table>
<thead>
<tr>
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### Method of assessment

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<td>examination talks (Testate, approx. 15 minutes each), log (approx. 5 to 10 pages)</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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<td>graduate</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** (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**

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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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### Project Work

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<td>head of the research group offering the module</td>
<td>Chair of Chemical Technology of Material Synthesis</td>
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<tbody>
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<td>1 semester</td>
<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

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

#### Module title
- Practical course medicinal chemistry

#### Abbreviation
- 08-MCM1-102-m01

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

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

#### ECTS
- 10

#### Method of grading
- (not) successfully completed

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

#### Duration
- 1 semester

#### Module level
- Graduate

#### Other prerequisites
- --

### 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
### 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 successfully completed module(s)

### Duration
1 semester

### Module level
Graduate

### Other prerequisites
--

### 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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# Module Catalogue for the Subject Chemistry

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

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<td>Programming in Theoretical Chemistry</td>
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<td>Institute of Physical and Theoretical Chemistry</td>
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</table>

## 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

<table>
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## Method of assessment

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<td>completion and discussion of approx. 5 programming exercises as well as talk (approx. 45 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 I

(examination regulations for teaching-degree programmes)

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<tbody>
<tr>
<td>holder of the Chair of Functional Materials in Medicine and Dentistry</td>
<td>Faculty of Medicine</td>
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<tr>
<td>1 semester</td>
<td>graduate</td>
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</table>

### Contents

In-depth knowledge and practical application of:
- free radical polymerisation, polyaddition
- ionic polymerisations
- controlled radical polymerisation
- polymer characterisation (e.g. gel permeation chromatography, end-group analysis, mass spectrometry)
- current aspects of polymer research (e.g. block-copolymers, polymer topographies, polymer functionalisation).

### Intended learning outcomes

Students acquire an advanced knowledge of polymer synthesis, modification and characterisation.

### Courses

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

### Method of assessment

(a) written examination (approx. 90 minutes) or (b) oral examination of one candidate each (20 minutes) or (c) 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 offered by</th>
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<td>lecturer of seminar &quot;Laserspektroskopie&quot; (Laser Spectroscopy)</td>
<td>Institute of Physical and Theoretical Chemistry</td>
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<td>graduate</td>
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</table>

**Contents**

This module introduces students to the fundamental principles of laser spectroscopy. It discusses absorption and emission spectroscopy.

**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.

**Courses**

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

**Method of assessment**

written examination (90 minutes) or oral examination (20 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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<tbody>
<tr>
<td>1 semester</td>
<td>graduate</td>
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</table>

**Contents**

This 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 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**

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

**Allocation of places**

--

**Additional information**

Additional information on module duration: block placement with a duration of a minimum of 20 working days.

**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

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### Module title

**Physical Chemistry (Advanced Lab)**

### Abbreviation

08-PCM6-132-m01

### Module coordinator

**Physicscal Chemie (Physical Chemistry)**

### Module offered by

Institute of Physical and Theoretical Chemistry

### ECTS

5

### Method of grading

(only) successfully completed

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

08-PCM1

### 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 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

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Language of assessment: German or English

### Allocation of places

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### Additional information

Additional information on module duration: block placement with a duration of a minimum of 20 working days.

### Referred to in LPO I

(examination regulations for teaching-degree programmes)

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<th>Module offered by</th>
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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>
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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**

--

**Additional information**

--

**Referred to in LPO I**

(examination regulations for teaching-degree programmes)
**Module title**

Practical course Homogeneous catalysis in Inorganic Chemistry

**Abbreviation**

08-HKM3AC-132-m01

**Module coordinator**

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

**Module offered by**

Institute of Inorganic Chemistry

**ECTS**

5

**Method of grading**

Only after 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 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**

--

**Additional information**

Additional information on module duration: block placement with a duration of a minimum of 20 working days.

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

--
### Module title
Practical course Homogeneous catalysis in Organic Chemistry

### Abbreviation
08-HKM3OC-132-m01

### Module coordinator
Lecturer of the seminar "Spezielle Metallorganische Chemie and deren Anwendung in der Homogenkatalyse"

### Module offered by
Institute of Organic Chemistry

### ECTS
5

### Method of grading
Only after successfully completed module(s)

### 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 (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
--

### Additional information
Additional information on module duration: block placement with a duration of a minimum of 20 working days.

### Referred to in LPO I
(examination regulations for teaching-degree programmes)
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<td>Theoretical Chemistry - Project course wave-packet dynamics</td>
<td>08-TCAP1-132-m01</td>
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**Module coordinator**
head of the research group offering the module

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

**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 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. The focus will be on wave packet dynamics.

**Intended learning outcomes**
Students have learned some of the methods typically used in theoretical chemistry and, in particular, in wave packet dynamics. They are able to explain issues that are relevant to the field of wave packet dynamics.

**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 (approx. 30 minutes)  
Language of assessment: German or English

**Allocation of places**
--

**Additional information**
Additional information on module duration: 4 weeks.

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

**Theoretical Chemistry - Project coursewave function based methods**

**Abbreviation**

08-TCAP2-132-m01

### Module coordinator

head of the research group offering the module

### Module offered by

Institute of Physical and Theoretical Chemistry

### ECTS

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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. The focus will be on wave function methods.

### Intended learning outcomes

Students have learned some of the methods typically used in theoretical chemistry and, in particular, in wave function methods. They are able to explain issues that are relevant to the field of wave function methods.

### Courses

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

### Method of assessment

presentation (approx. 30 minutes)

Language of assessment: German or English

### Allocation of places

--

### Additional information

Additional information on module duration: 4 weeks.

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

--
### Module title
Theoretical Chemistry - Project course Computational Photochemistry

### Abbreviation
08-TCAP3-132-m01

### Module coordinator
head of the research group offering the module

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

### ECTS
5

### 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. The focus will be on theoretical photochemistry.

### Intended learning outcomes
Students have learned some of the methods typically used in theoretical chemistry and, in particular, in theoretical photochemistry. They are able to explain issues that are relevant to the field of theoretical photochemistry.

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

### Method of assessment
presentation (approx. 30 minutes)

Language of assessment: German or English

### Allocation of places
--

### Additional information
Additional information on module duration: 4 weeks.
Other additional qualifications

(10 ECTS credits)
Module title | Abbreviation
---|---
Tutoring 1 (practical course) | 08-WRM1-132-m01

Module coordinator | Module offered by
Dean of Studies Chemie (Chemistry) | Faculty of Chemistry and Pharmacy

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

Duration | Module level | Other prerequisites
---|---|---
1 semester | graduate | Using activities performed under a research assistant contract for this module is not permitted. The exercise must accompany a different course than the exercise held in module 08-WRM2.

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

Method of assessment
preparation of materials for demonstrations and exercises (approx. 120 hours total)
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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<thead>
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<td>Using activities performed under a research assistant contract for this module is not permitted. The exercise must accompany a different course than the exercise held in module 08-WRM1.</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 (approx. 120 hours total)
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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<td>Erasmus programme coordinator Chemie (Chemistry)</td>
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<th>Other prerequisites</th>
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</thead>
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<td>Admission prerequisite to assessment: regular attendance of placement (a maximum of 2 incidents of absence); consultation with course advisory service prior to placement highly recommended; not to be combined with 08-APM2.</td>
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</table>

**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** *(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**

--

**Additional information**

Additional information on module duration: block placement abroad with a duration of a minimum of 20 working days.

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

--
Module title | Abbreviation
---|---
Foreign Studies (long) | 08-APM2-132-m01

**Module coordinator**
Erasmus programme coordinator Chemie (Chemistry)

**Module offered by**
Faculty of Chemistry and Pharmacy

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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**
(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**
--

**Additional information**
Additional information on module duration: block placement abroad with a duration of a minimum of 40 working days.

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

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<table>
<thead>
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<td>Chemistry-related courses outside of the Natural Sciences</td>
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**Contents**

This module gives students the opportunity to transfer credits from chemistry-related courses that are offered by other Faculties and are not explicitly included in the academic regulations for their programmes. Students MUST consult with their course advisors in advance.

**Intended learning outcomes**

Students have developed the knowledge and skills taught in the courses attended by them.

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

A (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 or successful completion as certified by the lecturer

Language of assessment: German, 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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<td>Chemistry-related courses within the Natural Sciences</td>
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**Contents**

This module gives students the opportunity to transfer credits from chemistry-related courses that are offered by other Faculties and are not explicitly included in the academic regulations for their programmes. Students MUST consult with their course advisors in advance.

**Intended learning outcomes**

Students have developed the knowledge and skills taught in the courses attended by them.

**Courses**

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

**Method of assessment**

Assessment or successful completion as certified by the lecturer

Language of assessment: German, 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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Compulsory Courses (double degree)
(5 ECTS credits)
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<th>Module title</th>
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<td>Toxicology and legal studies</td>
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<td>lecturer of lecture &quot;Toxikologie und Rechtskunde&quot;</td>
<td>Faculty of Medicine</td>
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<tbody>
<tr>
<td>1 semester</td>
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</table>

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

V + 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 (approx. 90 minutes)

**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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<td>Advanced chemical practical course</td>
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<tr>
<td>head of the research group offering the module</td>
<td>Faculty of Chemistry and Pharmacy</td>
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</table>

**Contents**

This module gives students the opportunity to explore a research topic and apply the methods commonly used in the discipline in question.

**Intended learning outcomes**

The student is able to deeply acquaint himself/herself with a specific research topic, and to process and to present the results in a written report or 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)

written report (approx. 3 pages)

Language of assessment: German, English

**Allocation of places**

--

**Additional information**

--

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

--
Compulsory Electives (double degree)
(55 ECTS credits)

Students must choose two focuses (focus 1 with 30 ECTS credits, focus 2 with 25 ECTS credits).
Inorganic Chemistry
(25-30 ECTS credits)
Compulsory Courses

(20 ECTS credits)
### Module Catalogue for the Subject Chemistry

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

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<tr>
<td>Managing Director of the Institute of Inorganic Chemistry</td>
<td>Institute of Inorganic Chemistry</td>
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<tbody>
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<td>graduate</td>
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</table>

### 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.

### 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.

### Courses

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

### Method of assessment

- **a)** written examination (approx. 90 to 180 minutes) or
- **b)** oral examination of one candidate each (approx. 20 to 30 minutes) or
- **c)** oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes)
- **d)** log (approx. 20 pages) or
- **e)** presentation (approx. 30 minutes).

Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, English

### Allocation of places

--

### Additional information

--

### Referred to in LPO I

(examination regulations for teaching-degree programmes)

--
Module title: Inorganic Chemistry practical course for advanced

Abbreviation: 08-ACPM-132-m01

Module coordinator: focus point coordinator "Inorganic Chemistry"

Module offered by: Institute of Inorganic 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 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 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:
P (no information on SWS (weekly contact hours) and course language available)

Method of assessment:
practical work with lab report (approx. 20 pages) and talk (approx. 15 minutes)

Language of assessment: German or English

Allocation of places:
--

Additional information:
Additional information on module duration: block placement with a duration of a minimum of 40 working days.

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

--
Compulsory Electives
(5-10 ECTS credits)
<table>
<thead>
<tr>
<th>Module title</th>
<th>Abbreviation</th>
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<tbody>
<tr>
<td>Bioanorganic Chemistry</td>
<td>08-ACM2-141-m01</td>
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<table>
<thead>
<tr>
<th>Module coordinator</th>
<th>Module offered by</th>
</tr>
</thead>
<tbody>
<tr>
<td>lecturer of seminar &quot;Anorganische Aspekte der Biochemie and Medizinischen Chemie&quot; (Inorganic Aspects of Biochemistry and Medicinal Chemistry)</td>
<td>Institute of Inorganic Chemistry</td>
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<th>Method of grading</th>
<th>Only after succ. compl. of module(s)</th>
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<thead>
<tr>
<th>Duration</th>
<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**

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) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, 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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<table>
<thead>
<tr>
<th>Module title</th>
<th>Abbreviation</th>
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<tbody>
<tr>
<td>Solid state chemistry and inorganic materials</td>
<td>08-ACM3-141-m01</td>
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<table>
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</thead>
<tbody>
<tr>
<td>lecturer of seminar &quot;Festkörperchemie und Anorganische Materialien&quot; (Solid State Chemistry and Inorganic Materials)</td>
<td>Institute of Inorganic Chemistry</td>
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<tr>
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</table>

### 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)

<table>
<thead>
<tr>
<th>Method of assessment</th>
<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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<td>Language of assessment: German, English</td>
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</table>

### Allocation of places

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### Additional information

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### Referred to in LPO I

(consultation regulations for teaching-degree programmes)

--
Module title: Advanced organometallic chemistry and its application in homogeneous catalysis
Abbreviation: 08-HKM2-141-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:
S (no information on SWS (weekly contact hours) and course language available)

Method of assessment:
(a) written examination (approx. 90 to 180 minutes) or (b) oral examination of one candidate each (approx. 20 to 30 minutes) or (c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or (d) log (approx. 20 pages) or (e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, 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>Computational Chemistry</td>
<td>08-TCM2-141-m01</td>
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<tbody>
<tr>
<td>lecturer of lecture &quot;Computational Chemistry&quot;</td>
<td>Institute of Physical and Theoretical Chemistry</td>
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<tr>
<td>1 semester</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

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

### Method of assessment

(a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, English

### Allocation of places

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### Additional information

--

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

--
**Module title** | **Abbreviation**
--- | ---
Advanced NMR- and Mass Spectrometry | 08-OCM-NMRMS-141-m01

**Module coordinator**
lab course supervisor

**Module offered by**
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**
\( P \) (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) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, English

**Allocation of places**
\( -- \)

**Additional information**
\( -- \)

**Referred to in LPO I** (examination regulations for teaching-degree programmes)
\( -- \)
Organic Chemistry
(25-30 ECTS credits)
Compulsory Courses
(15 ECTS credits)
Module title: Modern Synthetic Methods  
Abbreviation: 08-OCM-SYNT-141-m01

Module coordinator: lecturer of the seminar  
Module offered by: Institute of Organic 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 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:
- written examination (approx. 90 to 180 minutes)  
- oral examination of one candidate each (approx. 20 to 30 minutes)  
- oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes)  
- log (approx. 20 pages)  
- presentation (approx. 30 minutes)

Language of assessment: German, 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
Advanced NMR- and Mass Spectrometry

### Abbreviation
08-OCM-NMRMS-141-m01

### Module coordinator
lab course supervisor

### Module offered by
Institute of Organic 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 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
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) written examination (approx. 90 to 180 minutes) or
- b) oral examination of one candidate each (approx. 20 to 30 minutes) or
- c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or
- d) log (approx. 20 pages) or
- e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, 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)
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<table>
<thead>
<tr>
<th>Module title</th>
<th>Abbreviation</th>
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<tr>
<td>Advanced Research Project</td>
<td>08-OCM-AKP1-122-m01</td>
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<th>Module offered by</th>
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</thead>
<tbody>
<tr>
<td>head of the research group offering the module</td>
<td>Institute of Organic Chemistry</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 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**

--

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

--
Compulsory Electives
(10-15 ECTS credits)
<table>
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<tr>
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<tbody>
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<td>Modern Aspects of Natural Product Chemistry and Biological Chemistry</td>
<td>08-OCM-NAT-141-m01</td>
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<tbody>
<tr>
<td>lecturer of the seminar</td>
<td>Institute of Organic Chemistry</td>
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<tbody>
<tr>
<td>1 semester</td>
<td>graduate</td>
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</tbody>
</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** (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) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, English

**Allocation of places**

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

**Additional information**

--

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

--
Module title | Abbreviation
--- | ---
Organic Functional Materials | 08-OCM-FM-141-m01

| Module coordinator | Module offered by |
--- | ---
Lecturer of the seminar "Organische Funktionsmaterialien" | 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 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) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, English

**Allocation of places**

--

**Additional information**

--

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

--
## Module title

Organono- and Biocatalysis

## Abbreviation

08-HKM1-141-m01

## Module coordinator

Lecturer of the seminar "Organono- and Biokatalyse"

## 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 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

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

a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, English

### Allocation of places

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### Additional information

--

### Referred to in LPO 1

(examination regulations for teaching-degree programmes)

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

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

<table>
<thead>
<tr>
<th>ECTS</th>
<th>Method of grading</th>
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<tbody>
<tr>
<td>1 semester</td>
<td>graduate</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 (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)
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)
--
### Module title

<table>
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<th>Bioorganic Chemistry</th>
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### Abbreviation

| 08-SCM3-141-m01 |

### Module coordinator

| Bioorganic Chemistry |

### Module offered by

| Institute of Organic 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 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) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, English

### Allocation of places

| -- |

### Additional information

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<tbody>
<tr>
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<tr>
<td>Computational Chemistry</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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**Duration**

1 semester

**Module level**

graduate

**Other prerequisites**

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**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)

a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, 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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<thead>
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<td>Clinical and Analytical Chemistry (practical course)</td>
<td>08-PH-KACP-092-m01</td>
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<tr>
<td>lecturer of lecture &quot;Klinisch-analytische Chemie&quot; (Clinical and Analytical Chemistry)</td>
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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**

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

**Method of assessment**

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)

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Physical Chemistry
(25-30 ECTS credits)
Compulsory Courses
(20 ECTS credits)
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<td>Laser Spectroscopy</td>
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<td>lecturer of seminar &quot;Laserspektroskopie&quot; (Laser Spectroscopy)</td>
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**Contents**

This module introduces students to the fundamental principles of laser spectroscopy. It discusses absorption and emission spectroscopy.

**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.

**Courses**

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**Allocation of places**

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**Additional information**

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<td>Advanced Physical Chemistry (Lab)</td>
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**Contents**

This 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 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**

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

Language of assessment: German or English

**Allocation of places**

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**Additional information**

Additional information on module duration: block placement with a duration of a minimum of 20 working days.

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

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<td>lecturer of seminar &quot;Chemische Dynamik&quot; (Chemical Dynamics)</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 the investigation of 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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<td>Physikalische Chemie (Physical Chemistry)</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 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 (approx. 20 minutes)

Language of assessment: German or English

**Allocation of places**

--

**Additional information**

Additional information on module duration: block placement with a duration of a minimum of 20 working days.

**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

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Compulsory Electives

(5-10 ECTS credits)
### Module Catalogue for the Subject Chemistry

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

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<td>Nanoscale Materials</td>
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<td>Lecturer of the seminar &quot;Nanoskalige Materialien&quot;</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

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### Method of assessment

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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)

--
Module title
Ultrafast spectroscopy and quantum control

Abbreviation
08-PCM4-141-m01

Module coordinator
Lecturer of the seminar "Ultrakurzzeitspektroskopie und Quantenkontrolle"

Module offered by
Institute of Physical and Theoretical Chemistry

ECTS
5

Method of grading
Numerical grade

Only after succ. compl. of module(s)
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Duration
1 semester

Module level
Graduate

Other prerequisites
Prior successful completion of modules 08-PCM1a and 08-PCM1b is highly recommended.

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

Language of assessment: German, 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>Physical chemistry of supramolecular assemblies</td>
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<td>lecturer of the seminar &quot;Physikalische Chemie Supramolekularer Strukturen&quot;</td>
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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

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Language of assessment: German, English

Allocation of places

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Additional information

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<td>Theoretical Chemistry (Basics)</td>
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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**
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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**
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) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, English

**Allocation of places**
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**Additional information**
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### 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)

a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, English

### Allocation of places

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### Additional information

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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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</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 Theoretical Chemistry and learn some of the methods typically used in the discipline. The focus will be on wave packet dynamics.

**Intended learning outcomes**

Students have learned some of the methods typically used in theoretical chemistry and, in particular, in wave packet dynamics. They are able to explain issues that are relevant to the field of wave packet dynamics.

**Courses**

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

**Method of assessment**

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>
<thead>
<tr>
<th>Module title</th>
<th>Abbreviation</th>
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</thead>
<tbody>
<tr>
<td>Theoretical Chemistry - Project course wave function based methods</td>
<td>08-TCAP2-132-m01</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Module coordinator</th>
<th>Module offered by</th>
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<tbody>
<tr>
<td>head of the research group offering the module</td>
<td>Institute of Physical and Theoretical Chemistry</td>
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</thead>
<tbody>
<tr>
<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 Theoretical Chemistry and learn some of the methods typically used in the discipline. The focus will be on wave function methods.

**Intended learning outcomes**

Students have learned some of the methods typically used in theoretical chemistry and, in particular, in wave function methods. They are able to explain issues that are relevant to the field of wave function methods.

**Courses**

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

**Method of assessment**

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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<thead>
<tr>
<th>Module title</th>
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<tr>
<td>Theoretical Chemistry - Project course Computational Photochemistry</td>
<td>08-TCAP3-132-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 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. The focus will be on theoretical photochemistry.

**Intended learning outcomes**

Students have learned some of the methods typically used in theoretical chemistry and, in particular, in theoretical photochemistry. They are able to explain issues that are relevant to the field of theoretical photochemistry.

**Courses**

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

**Method of assessment**

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>
<thead>
<tr>
<th>Module title</th>
<th>Abbreviation</th>
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<tbody>
<tr>
<td>Material Sciences 1 (Principles)</td>
<td>08-FS1-141-m01</td>
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**Module coordinator**

Dean of Studies Funktionswerkstoffe (Functional Materials)

Chair of Chemical Technology of Material Synthesis

**ECTS**

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**Duration**

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<th>Module level</th>
<th>Other prerequisites</th>
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<tbody>
<tr>
<td>undergraduate</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**

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<th>type, number of weekly contact hours, language</th>
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<tr>
<td>V + Ü (no information on SWS (weekly contact hours) and course language available)</td>
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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) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, 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)

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<table>
<thead>
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<th>Module title</th>
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<tr>
<td>Lab Course Materials Science</td>
<td>08-FMM-MP-102-m01</td>
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<tr>
<td>lecturers specialisation subject Funktionsmaterialien (Functional Materials)</td>
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<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** (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 I** (examination regulations for teaching-degree programmes)

--
Biochemistry

(25-30 ECTS credits)
Compulsory Courses

(15 ECTS credits)
<table>
<thead>
<tr>
<th>Module title</th>
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<tbody>
<tr>
<td>Molecular Biology</td>
<td>08-BC-MOLM-141-m01</td>
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<tbody>
<tr>
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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** (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)

a) written examination (approx. 60 to 90 minutes) or b) log (approx. 20 pages) or c) oral examination of one candidate each (approx. 20 minutes) or d) oral examination in groups of up to 3 candidates (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) presentation (approx. 30 minutes). Students will be informed about the method and length of the assessment prior to 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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<tr>
<td>Molecular Biology Lab</td>
<td>08-BC-MOLP-141-m01</td>
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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**

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

**Method of assessment**

a) written examination (approx. 60 to 90 minutes) or b) log (approx. 20 pages) or c) oral examination of one candidate each (approx. 20 minutes) or d) oral examination in groups of up to 3 candidates (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or e) presentation (approx. 30 minutes). Students will be informed about the method and length of the assessment prior to the course.

Assessment offered: once a year, winter semester

Language of assessment: German, 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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Compulsory Electives
(10-15 ECTS credits)
Specialist Lab Course
(10 ECTS credits)
<table>
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<tbody>
<tr>
<td>Practical course Molecular Machines for advanced students</td>
<td>08-BC-VPMM-141-m01</td>
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<table>
<thead>
<tr>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>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 interactions, isolation and functional analysis of macromolecular complexes.</td>
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</table>

<table>
<thead>
<tr>
<th>Intended learning outcomes</th>
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<tbody>
<tr>
<td>The student is able to deeply acquaint himself/herself with a specific research topic, and to present the results in a talk.</td>
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<tbody>
<tr>
<td>log (approx. 20 pages) and talk (approx. 15 minutes)</td>
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<tr>
<td>Language of assessment: German, English</td>
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<tr>
<th>Additional information</th>
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<tbody>
<tr>
<td>Additional information on module duration: block placement with a duration of a minimum of 40 working days.</td>
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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 Protein Degradation in Eukaryotes for advanced students</td>
<td>08-BC-VPPD-141-m01</td>
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**Module coordinator**

holder of the Chair of Biochemistry

**Module offered by**

Chair of Biochemistry

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<tr>
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<td>08-BC-MOLP</td>
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</tbody>
</table>

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

**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, English

**Allocation of places**

--

**Additional information**

Additional information on module duration: block placement with a duration of a minimum of 40 working days.

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

--
### Module title
Practical course RNA Biochemistry for advanced students

### Abbreviation
08-BC-VPRB-141-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)
o8-BC-MOLP

### 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
(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, English

### Allocation of places
--

### Additional information
Additional information on module duration: block placement with a duration of a minimum of 40 working days.

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

--
**Module title**
Practical course Structural Biology for advanced students

**Abbreviation**
08-BC-VPSB-141-m01

**Module coordinator**
holder of the Chair of Biochemistry

**Module offered by**
Chair of Biochemistry

**ECTS**
10

**Method of grading**
numerical grade

**Method of assessment**
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**
(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, English

**Allocation of places**
--

**Additional information**
Additional information on module duration: block placement with a duration of a minimum of 40 working days.

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

--
Other Courses
(0-5 ECTS credits)
### Module title

**Principles of drug design**

### Abbreviation

08-MCM3-132-m01

### Module coordinator

Lecturers: Pharmazeutische Chemie (Pharmaceutical Chemistry)

### Module offered by

Institute of Pharmacy and Food Chemistry

### ECTS

5

### Method of grading

Numerical grade

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

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### Duration

1 semester

### Module level

Graduate

### Other prerequisites

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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

Presentation with discussion (approx. 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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## Bioanorganic Chemistry

<table>
<thead>
<tr>
<th>Module title</th>
<th>Abbreviation</th>
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<tbody>
<tr>
<td>Bioanorganic Chemistry</td>
<td>08-ACM2-141-m01</td>
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</tbody>
</table>

### 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

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</table>

### 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

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

### Method of assessment

a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, 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>Modern Aspects of Natural Product Chemistry and Biological Chemistry</td>
<td>08-OCM-NAT-141-m01</td>
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<th>Module offered by</th>
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<tbody>
<tr>
<td>lecturer of the seminar</td>
<td>Institute of Organic Chemistry</td>
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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

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

- a) written examination (approx. 90 to 180 minutes)
- b) oral examination of one candidate each (approx. 20 to 30 minutes)
- c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes)
- d) log (approx. 20 pages)
- e) presentation (approx. 30 minutes)

Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, 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)
### Module title

**Organo- and Biocatalysis**

### Abbreviation

08-HKM1-141-m01

### Module coordinator

Lecturer of the seminar "Organo- and Biokatalyse"

### 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 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) written examination (approx. 90 to 180 minutes) or (b) oral examination of one candidate each (approx. 20 to 30 minutes) or (c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or (d) log (approx. 20 pages) or (e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

### Language of assessment

German, 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>
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<tbody>
<tr>
<td>Clinical and Analytical Chemistry</td>
<td>08-PH-KAC-092-m01</td>
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<th>Module offered by</th>
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<tbody>
<tr>
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<td>Institute of Pharmacy and Food Chemistry</td>
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<tr>
<td>1 semester</td>
<td>undergraduate</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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<td>Clinical and Analytical Chemistry (practical course)</td>
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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**

--

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

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Functional Materials

(25-30 ECTS credits)
Compulsory Courses

(20 ECTS credits)
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<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**

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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>Project Work</td>
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<td>head of the research group offering the module</td>
<td>Chair of Chemical Technology of Material Synthesis</td>
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**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)
### Module title

**Organic Functional Materials**

### Abbreviation

08-OCM-FM-141-m01

### Module coordinator

Lecturer of the seminar "Organische Funktionsmaterialien"

### Module offered by

Institute of Organic Chemistry

### ECTS

5

### Method of grading

Numerical grade

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

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### 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) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, 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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<thead>
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<th>Module title</th>
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<td>Material Sciences 1 (Principles)</td>
<td>08-FS1-141-m01</td>
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<td>Dean of Studies Funktionswerkstoffe (Functional Materials)</td>
<td>Chair of Chemical Technology of Material Synthesis</td>
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**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**

(a) written examination (approx. 90 to 180 minutes) or (b) oral examination of one candidate each (approx. 20 to 30 minutes) or (c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or (d) log (approx. 20 pages) or (e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, 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

(5-10 ECTS credits)
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<td>Material Sciences 2 (Materials)</td>
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### Module coordinator
Dean of Studies Funktionswerkstoffe (Functional Materials)
Chair of Chemical Technology of Material Synthesis

### ECTS
5

### Method of grading
Numerical grade

### Duration
1 semester

### Module level
Undergraduate

### 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
(a) written examination (approx. 90 to 180 minutes) or (b) oral examination of one candidate each (approx. 20 to 30 minutes) or (c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or (d) log (approx. 20 pages) or (e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

### Language of assessment
German, 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
--- | ---
Chemically and bio-inspired Nanotechnology for Material Synthesis | 08-NTM-141-m01

Module coordinator | Module offered by
holder of the Chair of Chemical Technology of Material Synthesis | Chair of Chemical Technology of Material Synthesis

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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 (type, number of weekly contact hours, language — if other than German)
V + 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)
a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Allocation of places
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Additional information
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Referred to in LPO 1 (examination regulations for teaching-degree programmes)
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<td>Nanoscale Materials</td>
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<td>Institute of Physical and Theoretical Chemistry</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

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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>Supramolecular Chemistry (Basics)</td>
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**Module coordinator**
lecturer of lecture "Organischen Chemie"

**Module offered by**
Faculty of Chemistry and Pharmacy

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**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**
--

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

### Abbreviation
08-TCM2-141-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
--

### 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
(a) written examination (approx. 90 to 180 minutes) or (b) oral examination of one candidate each (approx. 20 to 30 minutes) or (c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or (d) log (approx. 20 pages) or (e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, English

### Allocation of places
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### Additional information
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(examination regulations for teaching-degree programmes)

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**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 examination

**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>Solid state chemistry and inorganic materials</td>
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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) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, English

**Allocation of places**

--

**Additional information**

--

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

--
### Module title
Polymer Chemistry

### Abbreviation
03-FU-PM1-141-m01

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<thead>
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<th>Module coordinator</th>
<th>Module offered by</th>
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<tbody>
<tr>
<td>holder of the Chair of Functional Materials in Medicine and Dentistry</td>
<td>Faculty of Medicine</td>
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<th>Module level</th>
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<tr>
<td>1 semester</td>
<td>graduate</td>
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</table>

### Contents
Basic methods of polymerisation: free radical polymerisations, polyadditions, ionic polymerisations, controlled radical polymerisations; characterisation of polymers and polymer analytics: gel permeation chromatography, endgroup analysis, mass spectrometry, rheology.

### Intended learning outcomes
The students are familiar with the fundamentals of polymer chemistry and the related methods for their characterisation.

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

- 03-FU-PM1-1-141: V (no information on SWS (weekly contact hours) and course language available)
- 03-FU-PM1-2-122: 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 03-FU-PM1-1-141: Polymer Chemistry (Lecture)**

- 3 ECTS, Method of grading: numerical grade
- a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

**Assessment in module component 03-FU-PM1-2-122: Polymer Chemistry (Practical course)**

- 2 ECTS, Method of grading: (not) successfully completed
- Vortestate (pre-experiment exams, approx. 15 minutes each) and logs (approx. 5 pages each)
- Assessment offered: once a year, summer semester
- Language of assessment: German, English if agreed upon with the examiner

### 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>03-PM2-122-m01</td>
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</table>

**Contents**

In-depth knowledge and practical application of:
- free radical polymerisation, polyaddition
- ionic polymerisations
- controlled radical polymerisation
- polymer characterisation (e.g. gel permeation chromatography, end-group analysis, mass spectrometry)
- current aspects of polymer research (e.g. block-copolymers, polymer topographies, polymer functionalisation).

**Intended learning outcomes**

Students acquire an advanced knowledge of polymer synthesis, modification and characterisation.

**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)

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each (20 minutes) or c) 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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Homogeneous Catalysis
(25-30 ECTS credits)
Compulsory Courses
(20 ECTS credits)
Module title | Abbreviation
---|---
Organo- and Biocatalysis | 08-HKM1-141-m01

Module coordinator | Module offered by
Lecturer of the seminar "Organo- and Biokatalyse" | 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 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) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, 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

**Advanced organometallic chemistry and its application in homogeneous catalysis**

| Abbreviation | 08-HKM2-141-m01 |

### Module Coordinator

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

**Module offered by**
- Institute of Inorganic Chemistry

### ECTS

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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) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

  Language of assessment: German, 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>Practical course Homogeneous catalysis in Inorganic Chemistry</td>
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**Module coordinator**

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

**Module offered by**

Institute of Inorganic Chemistry

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**Duration**

1 semester

**Module level**

graduate

**Other prerequisites**

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**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 (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 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**

Additional information on module duration: block placement with a duration of a minimum of 20 working days.

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

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<tr>
<td>lecturer of the seminar &quot;Spezielle Metallorganische Chemie and deren Anwendung in der Homogenkatalyse&quot;</td>
<td>Institute of Organic Chemistry</td>
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**Contents**

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**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 (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**

--

**Additional information**

Additional information on module duration: block placement with a duration of a minimum of 20 working days.

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

--
Compulsory Electives
(5-10 ECTS credits)
Module title
Advanced transition metal chemistry

Abbreviation
08-HKM4-141-m01

Module coordinator
Lecturer of the seminar "Spezielle Übergangsmetallchemie"

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

Method of assessment
(a) written examination (approx. 90 to 180 minutes) or (b) oral examination of one candidate each (approx. 20 to 30 minutes) or (c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or (d) log (approx. 20 pages) or (e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, 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>Chemical Dynamics</td>
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<tr>
<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 chemical reactions.

**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**

--

**Additional information**

--

**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

--
**Module title** | **Abbreviation**
---|---
Modern Synthetic Methods | 08-OCM-SYNT-141-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 | -- |

### 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) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, 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)

--
Module title
Computational Chemistry

Abbreviation
08-TCM2-141-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
--

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
a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, 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
Polymer Chemistry

Abbreviation
03-FU-PM1-141-m01

Module coordinator
holder of the Chair of Functional Materials in Medicine and Dentistry

Module offered by
Faculty of Medicine

ECTS
5

Method of grading
numerical grade

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

Duration
1 semester

Module level
graduate

Other prerequisites
--

Contents
Basic methods of polymerisation: free radical polymerisations, polyadditions, ionic polymerisations, controlled radical polymerisations; characterisation of polymers and polymer analytics: gel permeation chromatography, endgroup analysis, mass spectrometry, rheology.

Intended learning outcomes
The students are familiar with the fundamentals of polymer chemistry and the related methods for their characterisation.

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.
- 03-FU-PM1-1-141: V (no information on SWS (weekly contact hours) and course language available)
- 03-FU-PM1-2-122: 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)
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 03-FU-PM1-1-141: Polymer Chemistry (Lecture)
- 3 ECTS, Method of grading: numerical grade
  a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Assessment in module component 03-FU-PM1-2-122: Polymer Chemistry (Practical course)
- 2 ECTS, Method of grading: (not) successfully completed
  Vortestate (pre-experiment exams, approx. 15 minutes each) and logs (approx. 5 pages each)
  Assessment offered: once a year, summer semester
  Language of assessment: German, English if agreed upon with the examiner

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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Medicinal Chemistry
(25-30 ECTS credits)
Compulsory Courses

(10 ECTS credits)
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<td>lecturers Pharmazeutische Chemie (Pharmaceutical 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)

--
Compulsory Electives
(15-20 ECTS credits)
Module title

Pharmaceutical/Medicinal Chemistry 1

Abbreviation

08-MCM2a-141-m01

Module coordinator

lecturers Pharmazeutische Chemie (Pharmaceutical Chemistry)

Module offered by

Institute of Pharmacy and Food Chemistry

ECTS

5

Method of grading

numerical grade

Only after succ. compl. of module(s)

--

Duration

1 semester

Module level

graduate

Other prerequisites

--

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)

a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

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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<td>Institute of Pharmacy and Food Chemistry</td>
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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)

a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

**Allocation of places**

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**Additional information**

--

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

--
### Module title
Principles of drug design

### Abbreviation
08-MCM3-132-m01

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

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

### ECTS
5

### Method of grading
Numerical grade

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

### Duration
1 semester

### Module level
Graduate

### Other prerequisites
--

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

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<td>08-PH-KAC-092-m01</td>
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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)

--
Module title: Modern Synthetic Methods
Abbreviation: 08-OCM-SYNT-141-m01

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

ECTS: 5
Method of grading: Only after success completion of module(s)
Numerical grade: --

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

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) written examination (approx. 90 to 180 minutes) or (b) oral examination of one candidate each (approx. 20 to 30 minutes) or (c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or (d) log (approx. 20 pages) or (e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, English

Allocation of places:
--

Additional information:
--

Referred to in LPO I (examination regulations for teaching-degree programmes):
--
**Module title**  
Modern Aspects of Natural Product Chemistry and Biological Chemistry

**Abbreviation**  
08-OCM-NAT-141-m01

**Module coordinator**  
lecturer of the seminar

**Module offered by**  
Institute of Organic Chemistry

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**Duration**  
1 semester

**Module level**  
graduate

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**  
(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) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, 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 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) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, English

**Allocation of places**

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**Additional information**

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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** (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)

a) written examination (approx. 60 to 90 minutes) or b) log (approx. 20 pages) or c) oral examination of one candidate each (approx. 20 minutes) or d) oral examination in groups of up to 3 candidates (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) presentation (approx. 30 minutes). Students will be informed about the method and length of the assessment prior to 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
Practical course Structural Biology for advanced students

### Abbreviation
08-BC-VPSB-141-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)
08-BC-MOLP

### 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, English

### Allocation of places
--

### Additional information
Additional information on module duration: block placement with a duration of a minimum of 40 working days.

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

--
Supramolecular Chemistry
(25-30 ECTS credits)
Compulsory Courses
(10 ECTS credits)
### Module title
Supramolecular Chemistry (Basics)

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

### Module offered by
Faculty of Chemistry and Pharmacy

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### 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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**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)

--
Compulsory Electives

(15-20 ECTS credits)

No less than one of the two modules 08-SCM3 or 08-PCM5 must be completed in the focus.
### Module title
Bioorganic Chemistry

### Abbreviation
08-SCM3-141-m01

### Module coordinator
lecturer of lecture "Bioorganische Chemie" (Bioorganic Chemistry)

### Module offered by
Institute of Organic Chemistry

### ECTS
5

### Method of grading
numerical grade

### Only after succ. compl. of module(s)
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### Duration
1 semester

### Module level
graduate

### Other prerequisites
--

### 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) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, 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
Physical chemistry of supramolecular assemblies

### Abbreviation
08-PCM5-141-m01

### Module coordinator
Lecturer of the seminar "Physikalische Chemie Supramolekularer Strukturen"

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

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### 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 and Ü, 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) or talk (approx. 30 minutes)
Language of assessment: German, English

### Allocation of places
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### Additional information
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### 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) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, 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

**Principles of drug design**

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### Module coordinator

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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

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### Method of assessment

| presentation with discussion (approx. 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 1 (examination regulations for teaching-degree programmes)

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Module title | Abbreviation
---|---
Computational Chemistry | 08-TCM2-141-m01

| Module coordinator | Module offered by |
---|---
lecturer of lecture "Computational Chemistry" | Institute of Physical and Theoretical Chemistry |

| 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 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)
a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, English

**Allocation of places**
--

**Additional information**
--

**Referred to in LPO I** (examination regulations for teaching-degree programmes)
--
Module title | Abbreviation
---|---
Organic Functional Materials | 08-OCM-FM-141-m01

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<tr>
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<th>Module offered by</th>
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<tbody>
<tr>
<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

<table>
<thead>
<tr>
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### Method of assessment

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<td>a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.</td>
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Language of assessment: German, 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>Nanoscale Materials</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**

--

**Additional information**

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

--
Theoretical Chemistry
(25-30 ECTS credits)
Compulsory Courses

(10 ECTS credits)
## 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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<td>Theoretical Chemistry (Basics)</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

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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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Compulsory Electives

(15-20 ECTS credits)
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<tr>
<td>Theoretical Chemistry - Project course wave-packet dynamics</td>
<td>08-TCAP1:132-m01</td>
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**Module coordinator**
head of the research group offering the module

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

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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. The focus will be on wave packet dynamics.

**Intended learning outcomes**
Students have learned some of the methods typically used in theoretical chemistry and, in particular, in wave packet dynamics. They are able to explain issues that are relevant to the field of wave packet dynamics.

**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 (approx. 30 minutes)
Language of assessment: German or English

**Allocation of places**
--

**Additional information**
Additional information on module duration: 4 weeks.

**Referred to in LPO I**
(examination regulations for teaching-degree programmes)
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<td>Theoretical Chemistry - Project coursewave function based methods</td>
<td>08-TCAP2-132-m01</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. The focus will be on wave function methods.

### Intended learning outcomes

Students have learned some of the methods typically used in theoretical chemistry and, in particular, in wave function methods. They are able to explain issues that are relevant to the field of wave function methods.

### Courses

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

### Method of assessment

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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<td>Theoretical Chemistry - Project course Computational Photochemistry</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. The focus will be on theoretical photochemistry.

**Intended learning outcomes**

Students have learned some of the methods typically used in theoretical chemistry and, in particular, in theoretical photochemistry. They are able to explain issues that are relevant to the field of theoretical photochemistry.

**Courses**

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

**Method of assessment**

- 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>

**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)

a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2: approx. 30 minutes, groups of 3: approx. 40 minutes) or d) log (approx. 20 pages) or e) presentation (approx. 30 minutes). Students will be informed about the type and length of assessment prior to the course.

Language of assessment: German, 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>Principles of drug design</td>
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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** (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**

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**Additional information**

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

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Key Area 1 (double degree)
(30 ECTS credits)
Key Area 2 (double degree)

(25 ECTS credits)
Courses at partner university abroad
(30 ECTS credits)
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### Contents

The topics covered in this module correspond to the syllabus of the foreign partner university.

### Intended learning outcomes

Students have developed the knowledge and skills taught in the courses attended by them at the partner university.

### Courses

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

### Method of assessment

Assessment or successful completion as certified by the lecturer; methods of assessment: a) written examination (approx. 90 to 180 minutes) or b) oral examination of one candidate each (approx. 20 to 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes); students will be informed about the method and length of the assessment prior to 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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**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 (approx. 60 to 80 pages)
Language of assessment: German or English

**Allocation of places**

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**Additional information**

Additional information on module duration: 6 months.

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

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