Module Catalogue
for the Subject
Functional Materials
as a Bachelor’s with 1 major
with the degree "Bachelor of Science"
(180 ECTS credits)

Examination regulations version: 2012
Responsible: Faculty of Chemistry and Pharmacy
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Content and Objectives of the Programme

The Bachelor of Science program Functional Materials at the faculty of Chemistry and Pharmacy prepares students for research and development occupations of both a scientific and a practical nature in the field of materials and natural sciences. Students learn the basic methodical principles of scientific work. The study program’s interdisciplinary focus enables students to obtain extensive fundamental knowledge of the fields of chemistry, physics and mathematics. In addition, they acquire expert knowledge of the following engineering and natural sciences subjects: electronics, engineering mechanics, materials science, molecular materials, and compound materials. Close cooperation with the Fraunhofer Institute for Silicate Research ISC, Würzburg-Schweinfurt University of Applied Sciences, the Bavarian Center for Applied Energy Research and the SKZ plastics center guarantees an interdisciplinary education. Thanks to this, students are introduced to multifaceted topics relating to modern functional materials. By means of their bachelor’s thesis, students show that they have the ability to act largely independently to solve a specific, time-limited experimental or theoretical assignment of engineering or natural sciences tasks. The results of the bachelor’s thesis are presented and defended in a colloquium. The Bachelor of Science degree qualifies students for an occupation of both a scientific and a practical nature in the field of materials and natural sciences in general and of functional materials in particular. However, this generally requires a further qualification to be acquired either through practical experience in industry or through a consecutive master’s degree.
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)):

11-Dec-2012 (2012-186)

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 Courses
(123 ECTS credits)
Module title | Abbreviation
---|---
Mathematics 1 and 2 for students of Functional Materials | 10-M-FUN12-122-m01

Module coordinator | Module offered by
Dean of Studies Mathematik (Mathematics) | Institute of Mathematics

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<tr>
<th>ECTS</th>
<th>Method of grading</th>
<th>Only after succ. compl. of module(s)</th>
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<td>18</td>
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</table>

Duration | Module level | Other prerequisites
---|---|---
2 semester | undergraduate | By way of exception, additional prerequisites are listed in the section on assessments.

Contents
Basics on numbers and functions, sequences and series, elementary functions, differential and integral calculus in one variable, vector calculus, linear maps and systems of linear equations, matrix calculus, eigenvalue theory, differential and integral calculus in several variables, differential equations, Fourier analysis, integral theorems.

Intended learning outcomes
The student gets acquainted with important concepts and methods of mathematics. He/She learns to apply these methods to problems in natural and engineering sciences, in particular in the technology of functional materials, and is able to interpret the results.

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

- 10-M-FUN12-1-122: V + Ü (no information on SWS (weekly contact hours) and course language available)
- 10-M-FUN12-2-122: V + Ü (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 10-M-FUN12-1-122: Mathematics 1 for students of Functional Materials Mathematics 1 for students of Functional Materials

- 10 ECTS, Method of grading: (not) successfully completed
- written examination (approx. 90 to 120 minutes, usually chosen) or oral examination of one candidate each (approx. 20 minutes) or oral examination in groups (groups of 2, approx. 30 minutes)
- Language of assessment: German, English if agreed upon with the examiner
- Other prerequisites: Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective details at the beginning of the course. Registration for the course will be considered a declaration of will to seek admission to assessment. If students have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put their registration for assessment into effect. Students who meet all prerequisites will be admitted to assessment in the current or in the subsequent semester. For assessment at a later date, students will have to obtain the qualification for admission to assessment anew.


- 8 ECTS, Method of grading: numerical grade
- written examination (approx. 90 to 120 minutes, usually chosen) or oral examination of one candidate each (approx. 20 minutes) or oral examination in groups (groups of 2, approx. 30 minutes)
- Language of assessment: German, English if agreed upon with the examiner
- Other prerequisites: Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective details at the beginning of the course. Registration for the course will be considered a declaration of will to seek admission to assessment. If students have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put their registration for assessment into effect. Students who meet all prerequisites will be admitted to assessment in the current or in the subsequent semester. For assessment at a later date, students will have to obtain the qualification for admission to assessment anew.
put their registration for assessment into effect. Students who meet all prerequisites will be admitted to assessment in the current or in the subsequent semester. For assessment at a later date, students will have to obtain the qualification for admission to assessment anew.

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<th>Allocation of places</th>
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<th>Referred to in LPO I (examination regulations for teaching-degree programmes)</th>
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</table>
### Module title
Mathematics 3 for students of Physics and Engineering

### Abbreviation
11-MPI3-062-m01

### Module coordinator
Managing Director of the Institute of Theoretical Physics and Astrophysics

### Module offered by
Faculty of Physics and Astronomy

### ECTS
8

### Method of grading
Numerical grade

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

### Duration
1 semester

### Module level
Undergraduate

### Admissions prerequisite to assessment:
Successful completion of approx. 50% of exercises. Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective details at the beginning of the course. Registration for the course will be considered a declaration of will to seek admission to assessment. If students have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put their registration for assessment into effect. Students who meet all prerequisites will be admitted to assessment in the current or in the subsequent semester. For assessment at a later date, students will have to obtain the qualification for admission to assessment anew.

### Contents
Ordinary and partial differential equations in Physics.

### Intended learning outcomes
The students have basic mathematical knowledge of dynamic equations and solution methods for common and partial differential equations.

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

### Method of assessment
Written examination (approx. 120 minutes)

### Allocation of places

### Additional information

### Referred to in LPO I
(examination regulations for teaching-degree programmes)
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**Module coordinator**
Managing Director of the Institute of Applied Physics

**Module offered by**
Faculty of Physics and Astronomy

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**Duration**
1 semester

**Module level**
undergraduate

**Contents**
Mechanics, vibration theory, thermodynamics.

**Intended learning outcomes**
The students have basic knowledge of physics for engineering students.

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

**Method of assessment**
written examination (approx. 120 minutes)

**Allocation of places**
Only as part of pool of general key skills (ASQ): 20 places. Places will be allocated by lot.

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

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<td>11-ENNF2-062-m01</td>
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<th>Module offered by</th>
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<tr>
<td>Managing Director of the Institute of Applied Physics</td>
<td>Faculty of Physics and Astronomy</td>
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<td>1 semester</td>
<td>undergraduate</td>
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**Contents**

Science of electricity, magnetism, optics, Atomic Physics.

**Intended learning outcomes**

The students have basic knowledge of physics for engineering students.

**Courses**

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

**Method of assessment**

written examination (approx. 120 minutes)

**Allocation of places**

Only as part of pool of general key skills (ASQ): 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
### Functional Materials
#### Bachelor's with 1 major, 180 ECTS credits

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### Module coordinator
Managing Director of the Institute of Applied Physics

### Module offered by
Faculty of Physics and Astronomy

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<tr>
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### Duration
1 semester

### Module level
undergraduate

### Other prerequisites
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### Contents
Mechanics, vibration theory, thermodynamics, optics, X-rays, nuclear magnetic resonance, Atomic and Nuclear Physics.

### Intended learning outcomes
The students know the principles of Physics.

### 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) oral test (approx. 15 minutes) during experiment and b) ungraded written examination (approx. 90 minutes)

### Allocation of places
Only as part of pool of general key skills (ASQ): 15 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
Experimental Chemistry, General and analytical Chemistry Lab for engineering students

Abbreviation
08-IAC-122-m01

Module coordinator
lecturer of lecture "Experimentalchemie" (Experimental Chemistry)

Module offered by
Institute of Inorganic Chemistry

ECTS
10

Method of grading
numerical grade

Duration
1 semester

Module level
undergraduate

Other prerequisites
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Contents
This module provides students with an overview of the fundamental principles of chemistry. It focuses on particles, metals, acid-base reactions, the periodic table, chemical equilibrium and complexometry. In addition, the module introduces fundamental models of chemistry and principles of inorganic chemistry. It includes practical exercises based on the lecture on experimental chemistry and its extension. After a safety briefing, the students autonomously conduct experiments in the laboratory. The course focuses on laboratory safety, simple lab techniques, the synthesis of simple substances and analyses of unknown substances. In addition, students have the opportunity to advance their laboratory knowledge.

Intended learning outcomes
Students are able to explain the principles of the periodic table and to extract information from it. They are able to explain basic models of the structure of matter. They have developed the ability to use the language of chemical formulas to describe chemical reactions and to interpret them by identifying the type of reaction. Students are able to describe the main quantitative and qualitative analytical methods and their application areas. They are able to identify fundamental problems in chemistry and perform experiments to solve them. They have developed the ability to perform the necessary stoichiometric calculations and describe the chemical processes in an appropriate manner, both in written and oral form.

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

- 08-IAC-1-062: V (no information on SWS (weekly contact hours) and course language available)
- 08-IAC-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 08-IAC-1-062: Experimental Chemistry
- 5 ECTS, Method of grading: numerical grade
- written examination (approx. 90 minutes)

Assessment in module component 08-IAC-2-122: General and analytical Chemistry Lab for engineering students
- 5 ECTS, Method of grading: (not) successfully completed
- Vortestate (pre-experiment exams, approx. 15 minutes), assessment of practical performance (log approx. 5 to 10 pages), Nachtestate (post-experiment exams, approx. 15 minutes)
- Assessment offered: once a year, summer semester
- Language of assessment: German or English
- Only after successful completion of module components: Successful completion of module component 04-IAC-1 is a prerequisite for participation in module component 08-IAC-2.

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
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Organic Chemistry for engineering students | 08-IOC-122-m01

Module coordinator | Module offered by
lab course supervisor "Organisch-chemisches Praktikum für Studierende der Ingenieurwissenschaften" | Institute of Organic Chemistry

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</table>

Duration | Module level | Other prerequisites
1 semester | undergraduate | By way of exception, additional prerequisites are listed in the section on assessments.

Contents

This module will provide students with an overview of organic chemistry. Furthermore, in a lab course it introduces on the basics techniques of organic chemistry.

Intended learning outcomes

Students have become familiar with the fundamental principles of organic chemistry. They are able to identify fundamental problems in chemistry and perform experiments to solve them.

Courses

This module comprises 3 module components. Information on courses will be listed separately for each module component.

- 08-IOC-2-122: V + Ü (no information on SWS (weekly contact hours) and course language available)
- 08-IOC-3-122: P (no information on SWS (weekly contact hours) and course language available)
- 08-OC1-1-092: V + Ü (no information on SWS (weekly contact hours) and course language available)

Method of assessment

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

Assessment in module component 08-IOC-2-122: Organic Chemistry 2 for engineering students Organic Chemistry 2 for engineering students

- 5 ECTS, Method of grading: numerical grade
- a) 1 to 3 written examinations (1 written examination: approx. 90 minutes; 2 written examinations: approx. 60 or 90 minutes each; 3 written examinations: approx. 60 minutes each) or b) oral examination of one candidate each (approx. 20 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes)
- Language of assessment: German or English
- Only after successful completion of module components: Successful completion of module component 08-OC1-1 is a prerequisite for participation in module component 08-IOC-2.
- Other prerequisites: Admission prerequisite to assessment: successful completion of exercises in the respective classes as specified at the beginning of the course (usually 70% of exercises to be successfully completed) as well as regular attendance of exercises (usually a maximum of 2 incidents of unexcused absence).

Assessment in module component 08-IOC-3-122: Organic Chemistry for engineering students (practical course)

- 2 ECTS, Method of grading: (not) successfully completed
- Vorteste (pre-experiment exams, approx. 15 minutes), assessment of practical performance (log approx. 5 to 10 pages), Nachteste (post-experiment exams, approx. 15 minutes)
- Assessment offered: once a year, winter semester
- Language of assessment: German or English
- Only after successful completion of module components: Successful completion of module component 08-OC1-1 is a prerequisite for participation in module component 08-IOC-3.

Assessment in module component 08-OC1-1-092: Organic Chemistry 1 Organic Chemistry 1

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

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

### Allocation of places

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### Additional information

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

§ 62 (1) 2. Chemie "Organische und Bioorganische Chemie"
### Module Catalogue for the Subject

**Functional Materials**

**Bachelor’s with 1 major, 180 ECTS credits**

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<th>Abbreviation</th>
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<td>Physical Chemistry 1 for engineering students</td>
<td>08-IPC-122-m01</td>
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<th>Module coordinator</th>
<th>Module offered by</th>
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<tr>
<td>lab course supervisor &quot;Physikalische Chemie für Studierende der Ingenieurwissenschaften, Praktikum&quot;</td>
<td>Institute of Physical and Theoretical Chemistry</td>
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<td>18</td>
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<tr>
<th>Duration</th>
<th>Module level</th>
<th>Other prerequisites</th>
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<td>1 semester</td>
<td>undergraduate</td>
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### Contents

This module will provide students with an overview of physical chemistry. Furthermore, in a lab course it introduces the basics techniques of physical chemistry.

### Intended learning outcomes

Students have become familiar with the fundamental principles of physical chemistry. They are able to identify fundamental problems in chemistry and perform experiments to solve them.

### Courses

This module comprises 3 module components. Information on courses will be listed separately for each module component.

- 08-IPC-2-062: V + Ü (no information on SWS (weekly contact hours) and course language available)
- 08-IPC-1-091: V + Ü (no information on SWS (weekly contact hours) and course language available)
- 08-IPC-3-122: 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 08-IPC-2-062:** Physical Chemistry 2 (basics of quantum mechanics and spectroscopy) for engineering students Physical Chemistry 2 (basics of quantum mechanics and spectroscopy) for engineering students

- 8 ECTS, Method of grading: numerical grade
- written examination (approx. 90 minutes)

**Assessment in module component 08-IPC-1-091:** Physical Chemistry 1 (thermodynamics, electrochemistry) for engineering students Physical Chemistry 1 (thermodynamics, electrochemistry) for engineering students

- 5 ECTS, Method of grading: numerical grade
- written examination (approx. 90 minutes)

**Assessment in module component 08-IPC-3-122:** Physical Chemistry for engineering students, laboratory course

- 5 ECTS, Method of grading: (not) successfully completed
- Vortestate (pre-experiment exams, approx. 15 minutes), assessment of practical performance (log approx. 5 to 10 pages), Nachtestate (post-experiment exams, approx. 15 minutes)
- Assessment offered: once a year, summer semester
- Language of assessment: German or English
- Only after successful completion of module components: Successful completion of the two module components 08-IPC-1 and 08-IPC-2 is a prerequisite for participation in module component 08-IPC-3.

### Allocation of places

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### Additional information

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Referred to in LPO I (examination regulations for teaching-degree programmes)
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<table>
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<th>Module title</th>
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<tr>
<td>Basics of Electronics 1</td>
<td>99-EL1-122-m01</td>
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**Module coordinator**

Dean of the Faculty of Electrical Engineering at the University of Applied Sciences Würzburg-Schweinfurt

**Module offered by**

University of Applied Sciences Würzburg-Schweinfurt (FHWS)

**ECTS** | **Method of grading** | **Only after succ. compl. of module(s)** |
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**Duration** | **Module level** | **Other prerequisites** |
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<tbody>
<tr>
<td>1 semester</td>
<td>undergraduate</td>
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</tbody>
</table>

**Contents**
Theoretical and practical principles of science of electricity, passive linear networks, principles of semiconductors.

**Intended learning outcomes**
The students have basic knowledge of theoretical and practical science of electricity, especially of passive linear networks and semiconductors.

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

Language of assessment: German, English if agreed upon with the examiner

**Allocation of places**

--

**Additional information**

--

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

--
## Module Catalogue for the Subject
### Functional Materials
### Bachelor's with 1 major, 180 ECTS credits

<table>
<thead>
<tr>
<th>Module title</th>
<th>Abbreviation</th>
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<tbody>
<tr>
<td>Basics of Electronics 2</td>
<td>99-EL2-122-m01</td>
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| Dean of the Faculty of Electrical Engineering at the University of Applied Sciences Würzburg-Schweinfurt | University of Applied Sciences Würzburg-Schweinfurt (FHWS) |

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<table>
<thead>
<tr>
<th>Duration</th>
<th>Module level</th>
<th>Other prerequisites</th>
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</thead>
<tbody>
<tr>
<td>1 semester</td>
<td>undergraduate</td>
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</tbody>
</table>

### Contents
Theoretical and practical principles of the components of electrical engineering, basic circuits, basic elements of digital technology, combinatorial circuits and sequential circuits.

### Intended learning outcomes
The students have theoretical and practical knowledge of the components of electrical engineering, basic circuits, basic elements of digital technology, combinatorial circuits and sequential circuits.

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

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

Language of assessment: German, English if agreed upon with the examiner

### Allocation of places
--

### Additional information
--

### Referred to in LPO I
(examination regulations for teaching-degree programmes)
--
Module title
Molecular Materials (Lecture and practical course)

Abbreviation
08-CT-122-m01

Module coordinator
Dean of Studies Funktionswerkstoffe (Functional Materials)

Module offered by
Chair of Chemical Technology of Material Synthesis

ECTS
10

Method of grading
Numerical grade

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

Duration
1 semester

Module level
Undergraduate

Other prerequisites
By way of exception, additional prerequisites are listed in the section on assessments.

Contents
The module imparts the theoretical and practical 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)
This module comprises 2 module components. Information on courses will be listed separately for each module component.

- 08-CT-1-122: V + Ü (no information on SWS (weekly contact hours) and course language available)
- 08-CT-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 08-CT-1-122: Molecular Materials (Lecture) Molecular Materials (Lecture)
- 5 ECTS, Method of grading: numerical grade
- Presentation (approx. 30 minutes) and a) 1 to 3 written examinations (1 written examination: approx. 90 minutes; 2 written examinations: approx. 60 or 90 minutes each; 3 written examinations: approx. 60 minutes each) or b) oral examination of one candidate each (approx. 20 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes). Should a module component comprise more than one graded assessment, all assessments will be equally weighted, unless otherwise specified; should the lecturer want to make changes to the way in which assessments are weighted, he or she must do so by two weeks after the start of the course at the latest and must communicate this to students in an appropriate manner.
- Language of assessment: German or English
- Other prerequisites: Admission prerequisite to assessment: successful completion of exercises in the respective classes as specified at the beginning of the course (usually 70% of exercises to be successfully completed) as well as regular attendance of exercises (usually a maximum of 2 incidents of unexcused absence).

Assessment in module component 08-CT-2-122: Molecular Materials (Practical course)
- 5 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, winter semester
- Language of assessment: German or English
- Other prerequisites: Admission prerequisite to assessment: regular attendance (minimum 80%) of courses.

Allocation of places
Information on the allocation of places will be listed separately for each module component.

- 08-CT-1-122: --
• 08-CT-2-122: Students from the Faculty of Chemistry: no restrictions. Nanostrukturtechnik (Nanostructure Technology): 4. Should there be more than 4 applications from students of Nanostrukturtechnik (Nanostructure Technology), places will be allocated among these applicants as follows: (1) Places will be allocated by lot. (2) Should there be, within one module component, several courses with a restricted number of places, there will be a uniform regulation for the courses of one module component. In this case, places on all courses of a module component that are concerned will be allocated in a standardised procedure. In this procedure, applicants who already have successfully completed at least one other module component of the respective module will be given preferential consideration. (3) A waiting list will be maintained and places re-allocated as they become available.

Additional information

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

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<table>
<thead>
<tr>
<th>Module title</th>
<th>Abbreviation</th>
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<tbody>
<tr>
<td>Introduction to Functional Materials</td>
<td>11-TMS-102-m01</td>
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<th>Module offered by</th>
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<tr>
<td>Managing Director of the Institute of Applied Physics</td>
<td>Faculty of Physics and Astronomy</td>
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<td>Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective details at the beginning of the course. Registration for the course will be considered a declaration of will to seek admission to assessment. If students have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put their registration for assessment into effect. Students who meet all prerequisites will be admitted to assessment in the current or in the subsequent semester. For assessment at a later date, students will have to obtain the qualification for admission to assessment anew.</td>
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</table>

**Contents**

Theoretical and practical principles of physical material properties and semiconductor process technology, dielectrics, metals and oxides. Principles of structuring technology, growth and coating procedures.

**Intended learning outcomes**

The students have knowledge of the theoretical and practical principles of physical material properties and technology for material synthesis.

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

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

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

Written examination (approx. 120 minutes)

Assessment offered: When and how often assessment will be offered depends on the method of assessment and will be announced in due form under observance of Section 32 Subsection 3 ASPO (general academic and examination regulations) 2009.

**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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<tr>
<td>Principles of Cell Biology and Tissue Regeneration</td>
<td>03-FU-Zell-122-m01</td>
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<td>holder of the Chair of Orthopaedics (Jakob/Ebert)</td>
<td>Faculty of Medicine</td>
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</tbody>
</table>

**Contents**

Foundations of cell biology (cell structure, organelles, DNA, replication, protein biosynthesis, signal transduction, cell metabolism, stem cells, viruses and prokaryotes, immune system).

**Intended learning outcomes**

Students acquire deep knowledge about cell and molecular biology.

**Courses**

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

Language of assessment: German, English if agreed upon with the examiner

**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>
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<tr>
<th>Module title</th>
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<td>Biomaterials</td>
<td>03-FU-BM-122-m01</td>
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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>
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</table>

**Contents**

Fundamental and specific knowledge about biomaterials out of metals, ceramics and polymers with surface modification and characterisation. Fabrication as well as examples for application will be addressed. Modern approaches in biomaterial research including hydrogels, additive manufacturing, 3D cell scaffolds and materials for tissue engineering will also be discussed.

**Intended learning outcomes**

Students have developed a deep knowledge in the field of biomaterials, their use in clinics as well as methods for biomaterial fabrication.

**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-BM-1-122: V (no information on SWS (weekly contact hours) and course language available)
- 03-FU-BM-2-122: P + 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-BM-1-122: Biomaterials (Lecture)**

- 5 ECTS, Method of grading: numerical grade
- a) 1 to 3 written examinations (1 written examination: approx. 90 minutes; 2 written examinations: approx. 60 or 90 minutes each; 3 written examinations: approx. 60 minutes each) or b) oral examination of one candidate each (approx. 20 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes)
- Language of assessment: German, English if agreed upon with the examiner

**Assessment in module component 03-FU-BM-2-122: Biomaterials (Practical course and seminar)**

- 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**

--

**Additional information**

--

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

--
## Module title

### Advanced laboratory course of Functional Materials

### Abbreviation

08-FU-VP-122-m01

### Module coordinator

head of the research group offering the module

### Module offered by

Chair of Chemical Technology of Material Synthesis

### ECTS

3

### Method of grading

Only after succ. compl. of module(s)

### (not) successfully completed

--

### Duration

1 semester

### Module level

undergraduate

### Other prerequisites

Where applicable, topic-specific modules/module components as specified by supervisor (cf. Section 12 Subsection 4 FSB (subject-specific provisions)).

### 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

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

P

### 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)**

Language of assessment: German, English if agreed upon with the examiner

### Allocation of places

--

### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

--
Compulsory Electives

(25 ECTS credits)
Compulsory Electives Mechanical and Electrical Engineering
(17 ECTS credits)
### Module title
Basics of Applied Mechanics

### Abbreviation
99-TM-122-m01

### Module coordinator
Dean of the Faculty of Mechanical Engineering at the University of Applied Sciences Würzburg-Schweinfurt

### Module offered by
University of Applied Sciences Würzburg- Schweinfurt (FHWS)

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### Duration
1 semester

### Module level
undergraduate

### Other prerequisites
--

### Contents
Basics of statistics, strength of materials and dynamics.

### Intended learning outcomes
The students have methodological competencies in determining forces and stress resultants, in calculating tensions and deformations and in dimensioning components.

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

### Method of assessment
(a) 1 to 3 written examinations (1 written examination: approx. 90 minutes; 2 written examinations: approx. 60 or 90 minutes each; 3 written examinations: approx. 60 minutes each) or (b) oral examination of one candidate each (approx. 20 minutes) or (c) oral examination in groups (groups of 2, approx. 30 minutes)
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
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<td>Laboratory Course of mechanical and electrical Engineering</td>
<td>99-IP-122-m01</td>
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<td>Deans of the Faculties of Electrical Engineering and Mechanical Engineering at the University of Applied Sciences Würzburg-Schweinfurt</td>
<td>University of Applied Sciences Würzburg- Schweinfurt (FHWS)</td>
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<th>Other prerequisites</th>
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<tr>
<td>1 semester</td>
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<td>Admission prerequisite to assessment: regular attendance (minimum 80%) of courses.</td>
</tr>
</tbody>
</table>

### Contents

Engineering laboratory and internship experiments.

### Intended learning outcomes

The students have practical experiences in applying engineering methods in electrical and mechanical engineering.

### Courses

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

### Method of assessment

Placement report / fieldwork report / report on practical training / report on practical course / project report / report on technical course (approx. 15 to 30 pages)  
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)
<table>
<thead>
<tr>
<th>Module title</th>
<th>Abbreviation</th>
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<tbody>
<tr>
<td>Construction, Calculation and Assembly of Technical Products</td>
<td>99-CA-122-m01</td>
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**Module coordinator**

Dean of the Faculty of Mechanical Engineering at the University of Applied Sciences Würzburg-Schweinfurt

**Module offered by**

University of Applied Sciences Würzburg-Schweinfurt (FHWS)

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**Duration**

1 semester

**Module level**

undergraduate

**Other prerequisites**

--

**Contents**

Comprehensive view of the process of product development, including the corresponding specialist subjects based on a selected example.

**Intended learning outcomes**

The students have professional and methodological competencies in the development of products with a focus on construction (CAD), calculation (CAE) and production (CAM), including prototyping and product validation.

**Courses**

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

**Method of assessment**

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

Language of assessment: German, English if agreed upon with the examiner

**Allocation of places**

--

**Additional information**

--

**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

--
Compulsory Electives Physics

(11 ECTS credits)
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<td>Introduction to Nanoscience</td>
<td>11-EIN-092-m01</td>
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**Module coordinator**
Managing Director of the Institute of Applied Physics

**Module offered by**
Faculty of Physics and Astronomy

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**Duration**
2 semester
duration

**Module level**
undergraduate

**Other prerequisites**
Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective details at the beginning of the course. Registration for the course will be considered a declaration of will to seek admission to assessment. If students have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put their registration for assessment into effect. Students who meet all prerequisites will be admitted to assessment in the current or in the subsequent semester. For assessment at a later date, students will have to obtain the qualification for admission to assessment anew.

**Contents**
Introduction to the principles of producing, characterising and applying nanostructures.

**Intended learning outcomes**
The students have knowledge of the fundamental properties, technologies, characterising methods and functions of nanostructures.

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

**Method of assessment**
written examination (approx. 120 minutes, for modules with less than 4 ECTS credits approx. 90 minutes; unless otherwise specified)

**Allocation of places**
Only as part of pool of general key skills (ASQ): 15 places. Places will be allocated by lot.

**Additional information**
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**Referred to in LPO I**
(examination regulations for teaching-degree programmes)
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<table>
<thead>
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<td>Practical Course Physical Technology of Material Synthesis</td>
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<td>Managing Director of the Institute of Applied Physics</td>
<td>Faculty of Physics and Astronomy</td>
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</tr>
</tbody>
</table>

**Contents**

Physical material properties, growth and coating procedures, methods of characterisation and structuring technologies.

**Intended learning outcomes**

The students have knowledge of the practical basics of material characterisation and physical technology for material synthesis.

**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)

Preparing the experiment will be considered successfully completed if an oral test (duration: approx. 15 minutes) prior to the experiment is passed. Performing and evaluating the experiment will be considered successfully completed if a Testat (exam) is passed. An experiment log (approx. 8 pages) is to be prepared. Each component of the assessment can be repeated once in the respective semester. Only if both components of the assessment have been successfully completed in the same semester will the module component be considered successfully completed. Assessment offered: once a year, winter semester

**Allocation of places**

--

**Additional information**

--

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

--
Compulsory Electives Mathematics and Computer Science
(62 ECTS credits)
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<table>
<thead>
<tr>
<th><strong>Module coordinator</strong></th>
<th><strong>Module offered by</strong></th>
</tr>
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<tbody>
<tr>
<td>Dean of Studies Mathematik (Mathematics)</td>
<td>Institute of Mathematics</td>
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<th><strong>Method of grading</strong></th>
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<th><strong>Duration</strong></th>
<th><strong>Module level</strong></th>
<th><strong>Other prerequisites</strong></th>
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<tr>
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</tr>
</tbody>
</table>

**Contents**

Introduction to modern mathematical software for symbolic computation (e.g. Mathematica or Maple) and numerical computation (e.g. Matlab) to supplement the basic modules in analysis and linear algebra (10-M-ANA or 10-M-ANL) and 10-M-LNA. Computer-based solution of problems in linear algebra, geometry, analysis, in particular differential and integral calculus; visualisation of functions.

**Intended learning outcomes**

The student learns the use of advanced modern mathematical software packages, and is able to assess their fields of application to solve mathematical 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)

project in the form of programming exercises (type and expenditure of time to be specified by the lecturer at the beginning of the course)
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)

--
## Module Catalogue for the Subject
### Functional Materials
#### Bachelor's with 1 major, 180 ECTS credits

<table>
<thead>
<tr>
<th>Module title</th>
<th>Abbreviation</th>
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<tbody>
<tr>
<td>Ordinary Differential Equations for other Subjects</td>
<td>10-M-DGA-122-m01</td>
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<table>
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</tr>
</tbody>
</table>

### Contents
Existence and uniqueness theorem; continuous dependence of solutions on initial values, systems of linear differential equations, matrix exponential series, linear differential equations of higher order.

### Intended learning outcomes
The student is acquainted with the fundamental concepts and methods of the theory of ordinary differential equations. He/she is able to apply these methods to practical problems.

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

### Method of assessment
written examination (approx. 90 to 180 minutes); if announced by the lecturer, the written examination can be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups (groups of 2, approx. 30 minutes)

Language of assessment: German, English if agreed upon with the examiner

### Allocation of places
--

### Additional information
--

### Referred to in LPO I
(examination regulations for teaching-degree programmes)
--
Module title
Introduction to Functional Analysis for other Subjects

Abbreviation
10-M-FAA-122-m01

Module coordinator
Dean of Studies Mathematik (Mathematics)

Module offered by
Institute of Mathematics

ECTS
10

Method of grading
numerical grade

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

Module level
undergraduate

Other prerequisites
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Contents
Banach spaces and Hilbert spaces, bounded operators, principles of functional analysis.

Intended learning outcomes
The student knows the fundamental concepts and methods of functional analysis as well as the pertinent proof methods, is able to apply methods from linear algebra and analysis to functional analysis, and realises the broad applicability of the theory to other branches of mathematics.

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

Method of assessment
written examination (approx. 90 to 180 minutes); if announced by the lecturer, the written examination can be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups (groups of 2, approx. 30 minutes)

Language of assessment: German, English if agreed upon with the examiner

Allocation of places
--

Additional information
--

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

**Numerical Mathematics 1 for Economathematics**

### Abbreviation

10-M-NUW-122-m01

### Module coordinator

Dean of Studies Mathematik (Mathematics)

### Module offered by

Institute of Mathematics

### ECTS

10

### Method of grading

Only after succ. compl. of module(s)

### Duration

1 semester

### Module level

undergraduate

### Other prerequisites

Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective details at the beginning of the course. Registration for the course will be considered a declaration of will to seek admission to assessment. If students have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put their registration for assessment into effect. Students who meet all prerequisites will be admitted to assessment in the current or in the subsequent semester. For assessment at a later date, students will have to obtain the qualification for admission to assessment anew.

### Contents

Solution of systems of linear equations and curve fitting problems, nonlinear equations and systems of equations, interpolation with polynomials, splines and trigonometric functions, numerical integration.

### Intended learning outcomes

The student is acquainted with the fundamental concepts and methods in numerical mathematics, applies them to practical problems and knows about their typical fields of application.

### Courses

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

### Method of assessment

written examination (approx. 90 to 180 minutes); if announced by the lecturer, the written examination can be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups (groups of 2, approx. 30 minutes)

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)

--
Module title: Numerical Mathematics 2 for other Subjects
Abbreviation: 10-M-NUA-122-m01

Module coordinator: Dean of Studies Mathematik (Mathematics)
Module offered by: Institute of Mathematics
ECTS: 10
Method of grading: Only after succ. compl. of module(s)

Duration: 1 semester
Module level: undergraduate
Other prerequisites: Certain prerequisites must be met to qualify for admission to assessment. The lecturer will inform students about the respective details at the beginning of the course. Registration for the course will be considered a declaration of will to seek admission to assessment. If students have obtained the qualification for admission to assessment over the course of the semester, the lecturer will put their registration for assessment into effect. Students who meet all prerequisites will be admitted to assessment in the current or in the subsequent semester. For assessment at a later date, students will have to obtain the qualification for admission to assessment anew.

Contents
Eigenvalue problems, linear programming, methods for initial value problems for ordinary differential equations, boundary value problems.

Intended learning outcomes
The student is acquainted with fundamental and advanced concepts and methods in numerical mathematics, and is able to apply them independently to practical problems.

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

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)
written examination (approx. 90 to 180 minutes); if announced by the lecturer, the written examination can be replaced by an oral examination of one candidate each (approx. 20 minutes) or an oral examination in groups (groups of 2, approx. 30 minutes)
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>
<thead>
<tr>
<th>Module title</th>
<th>Abbreviation</th>
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<td>Programming course for students of Mathematics and other subjects</td>
<td>10-M-PRG-122-m01</td>
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<table>
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<td>Dean of Studies Mathematik (Mathematics)</td>
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</table>

**Contents**
Basics of a modern programming language (e.g. C).

**Intended learning outcomes**
The student is able to work independently on small programming exercises and standard programming problems in mathematics.

**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)
project in the form of programming exercises (type and expenditure of time to be specified by the lecturer at the beginning of the course)
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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<td>Databases</td>
<td>10-I-DB-102-m01</td>
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**Module coordinator**
Dean of Studies Informatik (Computer Science)

**Module offered by**
Institute of Computer Science

<table>
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<th>ECTS</th>
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<tbody>
<tr>
<td>5</td>
<td>numerical grade</td>
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</table>

**Duration**
1 semester

**Module level**
undergraduate

**Other prerequisites**
Admission prerequisite to assessment: exercises (type and scope to be announced by the lecturer at the beginning of the course).

**Contents**
Relational algebra and complex SQL statements; database planning and normal forms; transaction management.

**Intended learning outcomes**
The students possess knowledge about database modelling and queries in SQL as well as transactions.

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

**Method of assessment**
written examination (approx. 50 to 60 minutes); if announced by the lecturer by four weeks prior to the examination date, the written examination can be replaced by an oral examination of one candidate each or an oral examination in groups (one candidate each: 15 minutes, groups of 2: 20 minutes, groups of 3: 25 minutes)
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)
§ 49 (1) 1. b) Datenbanksysteme und Softwaretechnologie
§ 69 (1) 1. b) Datenbanksysteme und Softwaretechnologie
### Module title

**Introduction to Computer Science for Students of all Faculties**

### Abbreviation

10-I-EIN-111-m01

### Module coordinator

Dean of Studies Informatik (Computer Science)

### Module offered by

Institute of Computer Science

### ECTS

10

### Method of grading

Only after succ. compl. of module(s)

### Duration

1 semester

### Module level

undergraduate

### Other prerequisites

Admission prerequisite to assessment: academic requirements to be met in exercises as specified at the beginning of the course.

### Contents

Foundations of computer science including representation of information and websites (HTML, XML, EBNF), databases, algorithms and data structures, programming (Java).

### Intended learning outcomes

The students are familiar with the fundamentals of computer science, e.g. in the areas of representation of information and websites (HTML, XML, EBNF), databases, algorithms and data structures, programming in Java.

### Courses

<table>
<thead>
<tr>
<th>Type</th>
<th>Number of Weekly Contact Hours</th>
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<td>(no course language available)</td>
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</table>

### Method of assessment

a) written examination (80 to 90 minutes) or b) oral examination of one candidate each (approx. 20 minutes) or oral examination in groups of 2 or 3 candidates (30 or 40 minutes respectively)

### 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 Chemistry
(18 ECTS credits)
### Module Catalogue for the Subject
**Functional Materials**
Bachelor's with 1 major, 180 ECTS credits

<table>
<thead>
<tr>
<th>Module title</th>
<th>Abbreviation</th>
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<tbody>
<tr>
<td>Programming course for Chemistry Major</td>
<td>08-PKC-102-m01</td>
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<th>Module offered by</th>
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<tbody>
<tr>
<td>lecturer of lecture &quot;Programmierkurs für Chemiker&quot;</td>
<td>Institute of Physical and Theoretical Chemistry</td>
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<th>Other prerequisites</th>
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<tbody>
<tr>
<td>1 semester</td>
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<td>Admission prerequisite to assessment: successful completion of exercises in the respective classes as specified at the beginning of the course (usually 70% of exercises to be successfully completed) as well as regular attendance of exercises (usually a maximum of 2 incidents of unexcused absence).</td>
</tr>
</tbody>
</table>

### Contents
The module introduces students to the basics of a programming language and gives applications to problems related to chemistry.

### Intended learning outcomes
Students are able to describe the fundamentals of the programming language and to apply them to problems in 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)

practical examination: completion of programming exercises and oral description of algorithms used
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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<th>Module title</th>
<th>Biochemistry for Students of Functional materials</th>
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<tbody>
<tr>
<td>Abbreviation</td>
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<td>holder of the Chair of Biochemistry</td>
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</table>

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

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

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

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

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>Drug Product Development, Quality assurance and industrialization</td>
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<td>degree programme coordinator FOKUS Pharmazie (Pharmacy)</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 discusses advanced topics in drug product development, quality assurance and industrialisation.

**Intended learning outcomes**

Students have developed an advanced knowledge relating to drug product development, quality assurance and industrialisation and are able to apply that knowledge to research problems.

<table>
<thead>
<tr>
<th>Courses</th>
<th>(type, number of weekly contact hours, language — if other than German)</th>
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<td>S</td>
<td>(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) 1 to 3 written examinations (1 written examination: approx. 90 minutes; 2 written examinations: approx. 60 or 90 minutes each; 3 written examinations: approx. 60 minutes each) or b) oral examination of one candidate each (approx. 20 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes)

**Language of assessment:** German or English

**Allocation of places**

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**Additional information**

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

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<table>
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<tr>
<td>Chemically and bio-inspired Nanotechnology for Material Synthesis</td>
<td>08-NT-122-m01</td>
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<tr>
<td>holder of the Chair of Chemical Technology of Material Synthesis</td>
<td>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** (type, number of weekly contact hours, language — if other than German)

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

- 08-NT-1-122: V (no information on SWS (weekly contact hours) and course language available)
- 08-NT-2-122: V (no information on SWS (weekly contact hours) and course language available)

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

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

**Assessment in module component 08-NT-1-122: Sol-Gel Chemistry 1: Fundamentals**

- 2 ECTS, Method of grading: numerical grade
- a) written examination (approx. 45 minutes) or b) oral examination of one candidate each (approx. 20 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes)

**Assessment in module component 08-NT-2-122: From Biomineralisation to biologically inspired Materials Synthesis**

- 3 ECTS, Method of grading: numerical grade
- a) written examination (approx. 45 minutes) or b) oral examination of one candidate each (approx. 20 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes)

**Allocation of places**

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**Additional information**

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

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Compulsory Electives Medicine
(20 ECTS credits)
<table>
<thead>
<tr>
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<tr>
<td>Technology of Composite Materials (Lecture and practical course)</td>
<td>03-FU-TV-122-m01</td>
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**Module coordinator**

holder of the Chair of Functional Materials in Medicine and Dentistry

**Module offered by**

Faculty of Medicine

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</table>

**Duration**

1 semester

**Module level**

undergraduate

**Other prerequisites**

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**Contents**

Theoretical and practical fundamental knowledge of the fabrication and evaluation of composite respectively sandwich materials.

**Intended learning outcomes**

Students have developed a deep knowledge about the fabrication and evaluation of sandwich materials.

**Courses**

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

- 03-FU-TV-1-122: V (no information on SWS (weekly contact hours) and course language available)
- 03-FU-TV-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-TV-1-122: Technology of Composite Materials (Lecture)**

- 3 ECTS, Method of grading: numerical grade
- a) 1 to 3 written examinations (1 written examination: approx. 90 minutes; 2 written examinations: approx. 60 or 90 minutes each; 3 written examinations: approx. 60 minutes each) or b) oral examination of one candidate each (approx. 20 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes)
- Language of assessment: German, English if agreed upon with the examiner

**Assessment in module component 03-FU-TV-2-122: Technology of Composite Materials (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)

--
Module title | Abbreviation
---|---
Functionalized Biomaterials | 03-FU-FBM-122-m01

Module coordinator | Module offered by
holder of the Chair of Functional Materials in Medicine and Dentistry | Faculty of Medicine

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

Contents
Fundamental principles and specific knowledge for working in natural sciences in the field of biomaterials with surface modification and characterisation.

Intended learning outcomes
Students have developed an advanced knowledge in the field of biomaterials for use in implants.

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

- 03-FU-FBM-1-122: V (no information on SWS (weekly contact hours) and course language available)
- 03-FU-FBM-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-FBM-1-122: Functionalized Biomaterials (Lecture)
- 3 ECTS, Method of grading: numerical grade
- a) 1 to 3 written examinations (1 written examination: approx. 90 minutes; 2 written examinations: approx. 60 or 90 minutes each; 3 written examinations: approx. 60 minutes each) or b) oral examination of one candidate each (approx. 20 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes)
- Language of assessment: German, English if agreed upon with the examiner

Assessment in module component 03-FU-FBM-2-122: Functionalized Biomaterials (Practical course)
- 2 ECTS, Method of grading: (not) successfully completed
- Vortestate (pre-experiment exams, approx. 15 minutes each), 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
--

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

**Abbreviation**  
03-FU-PM1-122-m01

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

**Module offered by**  
Faculty of Medicine

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</table>

**Duration**  
1 semester

**Module level**  
undergraduate

**Other prerequisites**  
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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** (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-PM1-1-122: 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-PM1-1-122: Polymer Chemistry (Lecture)**

- 3 ECTS, Method of grading: numerical grade
- a) 1 to 3 written examinations (1 written examination: approx. 90 minutes; 2 written examinations: approx. 60 or 90 minutes each; 3 written examinations: approx. 60 minutes each) or b) oral examination of one candidate each (approx. 20 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes)
- Language of assessment: German, English if agreed upon with the examiner

**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>Principles of Tissue Engineering</td>
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<td>Faculty of Medicine</td>
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<td>graduate</td>
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</table>

### Contents

Medical foundations of organ and tissue damage, medical implants, xenotransplantation, cell culture technology, principles of tissue engineering, 2D and 3D tissue models, stem cell technology.

### Intended learning outcomes

The students have developed knowledge on the medical fundamentals of organ and tissue damage, medical implants, xenotransplantation, cell culture technology, principles of tissue engineering, 2D and 3D tissue models, stem cell technology.

### Courses

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

### Method of assessment

Students will be informed about the method, length and scope of the assessment prior to the course. Usually, one of the following options will be chosen: a) written examination (30 to 60 minutes, including multiple choice questions) or b) log (approx. 10 to 30 pages) or c) oral examination of one candidate each (30 to 60 minutes) or d) oral examination in groups of up to 3 candidates (approx. 30 to 60 minutes) or e) presentation (20 to 45 minutes)

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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Compulsory Electives Additional Qualifications

(20 ECTS credits)
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<td>Industrial Internship (Short)</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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<tbody>
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</table>

**Contents**

A placement in industry. The contents of the placement should correspond to the contents of a lab course offered in the context of the Bachelor’s programme in Functional Materials (180 ECTS credits); please consult with the competent coordinator in advance.

**Intended learning outcomes**

Students are familiar with procedures and processes used in industry. They have developed both subject-specific and interpersonal 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)

written report (approx. 5 to 10 pages)

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>Erasmus programme coordinator Funktionswerkstoffe (Functional Materials)</td>
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<td>Admission prerequisite to assessment: regular attendance of placement.</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 Functional Materials 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 (approx. 2 pages); proof of having completed lab course

Language of assessment: German or English; language of the respective placement country where required

**Allocation of places**

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**Additional information**

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**Referred to in LPO I**

(examination regulations for teaching-degree programmes)

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<table>
<thead>
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<td>Courses related to Functional Materials outside of the Natural Sciences</td>
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<td>Dean of Studies Funktionswerkstoffe (Functional Materials)</td>
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</table>

**Contents**

This module gives students the opportunity to transfer credits from functional materials-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)

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) 1 to 3 written examinations (1 written examination: approx. 90 minutes; 2 written examinations: approx. 60 or 90 minutes each; 3 written examinations: approx. 60 minutes each) or b) oral examination of one candidate each (approx. 20 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes) or d) successful completion as certified by lecturer

Language of assessment: German, English if agreed upon with the examiner

**Allocation of places**

--

**Additional information**

--

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

--
Module title
Courses related to Functional Materials inside of the Natural Sciences

Abbreviation
08-FU-WP2-122-m01

Module coordinator
Dean of Studies Funktionswerkstoffe (Functional Materials)

Module offered by
Chair of Chemical Technology of Material Synthesis

ECTS
5

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

Duration
1 semester

Module level
graduate

Other prerequisites
Please consult with course advisory service.

Contents
This module gives students the opportunity to transfer credits from functional materials-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)
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) 1 to 3 written examinations (1 written examination: approx. 90 minutes; 2 written examinations: approx. 60 or 90 minutes each; 3 written examinations: approx. 60 minutes each) or b) oral examination of one candidate each (approx. 20 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes) or d) successful completion as certified by lecturer

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)
--
Thesis
(12 ECTS credits)
## Module title

**Bachelor Thesis Functional Materials**

| Abbreviation | 08-FU-BT-122-m01 |

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### Module coordinator

Dean of Studies Funktionswerkstoffe (Functional Materials)

Chair of Chemical Technology of Material Synthesis

### ECTS

12

### Method of grading

numerical grade

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

--

### Duration

1 semester

### Module level

undergraduate

### Other prerequisites

By way of exception, additional prerequisites are listed in the section on assessments.

---

## 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.

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## Courses

This module has 2 components; information on courses listed separately for each component.

- 08-FU-BT-2-122: K (no information on language and number of weekly contact hours available)
- 08-FU-BT-1-122: A (no information on language and number of weekly contact hours available)

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## Method of assessment

This module has the following 2 assessment components. Unless stated otherwise, students must pass all of these assessment components to pass the module as a whole.

### Assessment component to module component 08-FU-BT-2-122: Kolloquium zur Bachelor-Arbeit

- 2 ECTS credits, method of grading: numerical grade
- Abschlusskolloquium mit talk (approx. 20 minutes) and Diskussion (approx. 20 minutes)
- Language of assessment: German or English

### Assessment component to module component 08-FU-BT-1-122: Bachelor-Arbeit

- 10 ECTS credits, method of grading: numerical grade
- written thesis (approx. 20–40 pages)
- Language of assessment: German or English
- Other prerequisites: Where applicable, topic-specific modules/module components as specified by supervisor (cf. Section 12 Subsection 4 FSB (subject-specific provisions)).

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## Allocation of places

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## Additional information

Additional information listed separately for each module component.

- 08-FU-BT-1-122: Additional information on module duration: 8 weeks.
- 08-FU-BT-2-122: --

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## Referred to in LPO I

(examination regulations for teaching-degree programmes)

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Subject-specific Key Skills

(15 ECTS credits)
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<td>Material Science 1 (basic introduction)</td>
<td>08-FS1-122-m01</td>
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</table>

**Contents**

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

**Intended learning outcomes**

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

**Courses**

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

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**Method of assessment**

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 | Abbreviation
--- | ---
Material Science 2 (the material groups) | 08-FS2-122-m01

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

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

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

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

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

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

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

**Contents**

Analytical principles, gravimetric methods, titration, chromatography, spectroscopic methods (UV-VIS, IR, Raman, emission, fluorescence, NMR etc.), surface analysis, structure analysis.

**Intended learning outcomes**

Students have developed modern analytics expertise.

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

This module has 2 components; information on courses listed separately for each component.

- 08-MAM-1-122: V (no information on language and number of weekly contact hours available)
- 08-MAM-2-122: P (no information on language and number of weekly contact hours 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)

This module has the following 2 assessment components. Unless stated otherwise, students must pass all of these assessment components to pass the module as a whole.

- **Assessment component to module component 08-MAM-1-122: Moderne Bio-Analytik**
  - 3 ECTS credits, method of grading: numerical grade
  - a) 1-3 written examinations (1 written examination: approx. 90 minutes, 2 written examinations: approx. 60 or 90 minutes each, 3 written examinations: approx. 60 minutes each) or b) oral examination of on candidate each (approx. 20 minutes) or c) oral examination in groups (groups of two, approx. 30 minutes).
  - Language of assessment: German or English

- **Assessment component to module component 08-MAM-2-122: Praktikum zu Moderne Bio-Analytik**
  - 2 ECTS credits, method of grading: (not) successfully completed
  - Vortestate (je approx. 15 minutes) and logs (je approx. 5 pages)
  - Assessment offered once a year, summer semester.
  - 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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