Subdivided Module Catalogue
for the Subject

FOKUS Physics

as a Master’s with 1 major

with the degree "Master of Science"

(120 ECTS credits)

Examination regulations version: 2006
Responsible: Faculty of Physics and Astronomy
Course of Studies - Contents and Objectives

The FOKUS master study program is a special course, which provides on the one hand short time study (only 8 semesters in a consecutive Bachelor and Master program) and on the other hand puts significant emphasis on early integration of research activities. This Master study program is embedded an financed through the »Elitenetzwerk Bayern« (ENB). The master course is especially preparing the students for their later scientific work in the field of Physics. Qualified graduates may pursue doctoral work (degree Dr. rer. nat.) at doctorate-granting institutions. The goal of the studies is it to mediate special knowledge on the most important subsections of the experimental and theoretical physics and to make the students familiar with the methods of scientific and physical thinking and working. By training of analytic thinking abilities the students acquire the ability to deal later with the various fields of applications and to compile the special knowledge obtained within the Bachelor programme. During the Master thesis the student should independently work on a new thematic and temporarily limited experimental or theoretical engineering-scientific task in the field of experimental or theoretical physics using well-known procedures and scientific criteria.
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: \( \text{NUM} \) = numerical grade, \( \text{B/NB} \) = (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:

\[ \text{ASPO2007} \]

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

\[ \text{15-May-2008 (2008-15)} \]

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.
The subject is divided into

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Module title | Abbreviation
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Current Topics in Experimental Physics | 11-EXE5-111-m01

Module coordinator | Module offered by
chairperson of examination committee | Faculty of Physics and Astronomy

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Contents

Current topics of Experimental Physics. Accredited academic achievements, e.g. in case of change of university or study abroad.

Intended learning outcomes

The students have advanced competencies corresponding to the requirements of a module of Experimental Physics of the Master’s programme. They have knowledge of a current subdiscipline of Experimental Physics and understand the measuring and/or evaluation methods necessary to acquire this knowledge. They are able to classify the subject-specific contexts and know the application areas.

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

V + R (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 can be chosen to earn a bonus)

a) written examination (approx. 120 minutes, for modules with less than 4 ECTS credits approx. 90 minutes; unless otherwise specified) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Language of assessment: German, English

Allocation of places

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Additional information

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

--
## Module title
Current Topics in Experimental Physics

## Abbreviation
11-EXE6-111-m01

### Module coordinator
chairperson of examination committee

### Module offered by
Faculty of Physics and Astronomy

### ECTS
6

### Method of grading
numerical grade

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

### Duration
1 semester

### Module level
graduate

### Other prerequisites
Approval by examination committee required.

## Contents
Current topics of Experimental Physics. Accredited academic achievements, e.g. in case of change of university or study abroad.

## Intended learning outcomes
The students have advanced competencies corresponding to the requirements of a module of Experimental Physics of the Master’s programme. They have knowledge of a current subdiscipline of Experimental Physics and understand the measuring and/or evaluation methods necessary to acquire this knowledge. They are able to classify the subject-specific contexts and know the application areas.

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

### Type, number of weekly contact hours, language — if other than German)

### Method of assessment
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

a) written examination (approx. 120 minutes, for modules with less than 4 ECTS credits approx. 90 minutes; unless otherwise specified) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Language of assessment: German, English

## Allocation of places
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## Additional information
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## Referred to in LPO I
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### Current Topics in Experimental Physics

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### Contents

Current topics of Experimental Physics. Accredited academic achievements, e.g. in case of change of university or study abroad.

### Intended learning outcomes

The students have advanced competencies corresponding to the requirements of a module of Experimental Physics of the Master’s programme. They have knowledge of a current subdiscipline of Experimental Physics and understand the measuring and/or evaluation methods necessary to acquire this knowledge. They are able to classify the subject-specific contexts and know the application areas.

### Courses

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

### Method of assessment

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Language of assessment: German, English

### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

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### Contents

Current topics of Experimental Physics. Accredited academic achievements, e.g. in case of change of university or study abroad.

### Intended learning outcomes

The students have advanced competencies corresponding to the requirements of a module of Experimental Physics of the Master’s programme. They have knowledge of a current subdiscipline of Experimental Physics and understand the measuring and/or evaluation methods necessary to acquire this knowledge. They are able to classify the subject-specific contexts and know the application areas.

### Courses

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

V + R (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 can be chosen to earn a bonus)

a) written examination (approx. 120 minutes, for modules with less than 4 ECTS credits approx. 90 minutes; unless otherwise specified) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Language of assessment: German, English

### Allocation of places

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### Additional information

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**Contents**

Current topics of Theoretical Physics. Accredited academic achievements, e.g. in case of change of university or study abroad.

**Intended learning outcomes**

The students have advanced competencies corresponding to the requirements of a module of Theoretical Physics of the Master's programme. They have advanced specialist knowledge of a subdiscipline of Theoretical Physics and have mastered the required methods. They are able to apply the acquired methods to current problems of Theoretical Physics.

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

V + R (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 can be chosen to earn a bonus)

a) written examination (approx. 120 minutes, for modules with less than 4 ECTS credits approx. 90 minutes; unless otherwise specified) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Language of assessment: German, English

**Allocation of places**

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**Additional information**

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

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### Module title
Current Topics in Theoretical Physics

### Abbreviation
11-EXT6-111-m01

### Module coordinator
chairperson of examination committee

### Module offered by
Faculty of Physics and Astronomy

### ECTS
6

### Method of grading
numerical grade

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

### Module level
graduate

### Other prerequisites
Approval by examination committee required.

## Contents
Current topics of Theoretical Physics. Accredited academic achievements, e.g. in case of change of university or study abroad.

## Intended learning outcomes
The students have advanced competencies corresponding to the requirements of a module of Theoretical Physics of the Master’s programme. They have advanced specialist knowledge of a subdiscipline of Theoretical Physics and have mastered the required methods. They are able to apply the acquired methods to current problems of Theoretical Physics.

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

## Method of assessment
(a) written examination (approx. 120 minutes, for modules with less than 4 ECTS credits approx. 90 minutes; unless otherwise specified) or (b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or (c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or (d) presentation/seminar presentation (approx. 30 minutes)

Language of assessment: German, English

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

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**Module title**

Current Topics in Theoretical Physics

**Abbreviation**

11-EXT7-111-m01

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**Contents**

Current topics of Theoretical Physics. Accredited academic achievements, e.g. in case of change of university or study abroad.

**Intended learning outcomes**

The students have advanced competencies corresponding to the requirements of a module of Theoretical Physics of the Master’s programme. They have advanced specialist knowledge of a subdiscipline of Theoretical Physics and have mastered the required methods. They are able to apply the acquired methods to current problems of Theoretical Physics.

**Courses**

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

**Method of assessment**

(a) written examination (approx. 120 minutes, for modules with less than 4 ECTS credits approx. 90 minutes; unless otherwise specified) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Language of assessment: German, English

**Allocation of places**

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**Additional information**

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

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**Contents**

Current topics of Theoretical Physics. Accredited academic achievements, e.g. in case of change of university or study abroad.

**Intended learning outcomes**

The students have advanced competencies corresponding to the requirements of a module of Theoretical Physics of the Master’s programme. They have advanced specialist knowledge of a subdiscipline of Theoretical Physics and have mastered the required methods. They are able to apply the acquired methods to current problems of Theoretical Physics.

**Courses**

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

V + R (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 can be chosen to earn a bonus)

a) written examination (approx. 120 minutes, for modules with less than 4 ECTS credits approx. 90 minutes; unless otherwise specified) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 minutes)

Language of assessment: German, English

**Allocation of places**

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**Additional information**

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**Referred to in LPO I**

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**Contents**

Mathematical foundations of the theory of relativity; differential forms; brief summary of special relativity; elements of differential geometry; electrodynamics as an example of a relativistic gauge theory; field equations of general relativity; stellar models; introduction to cosmology; Hamiltonian formulation

**Intended learning outcomes**

The students are familiar with the basic physical and mathematical concepts of general relativity. They have a mathematical understanding of the formulation of general relativity on the basis of differential forms. They are able to apply the acquired knowledge to problems of Astrophysics and cosmology.

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

V + R (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 can be chosen to earn a bonus)

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 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)

--
## Practical Course Astrophysics

### Abbreviation
11-APP-111-m01

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

### Module offered by
Faculty of Physics and Astronomy

### ECTS
6

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

### Duration
1 semester

### Module level
graduate

### 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
Astrophysical experiments in the fields of detectors, telescopes, methodology, analysis and astronomic observations.

### Intended learning outcomes
The students have mastered experimental methods of Astrophysics and are able to analyse and interpret the measuring data and present the results. They are familiar with the working methods of observational Astronomy and with basic techniques of detecting electromagnetic radiation. They are able to plan and evaluate observations and measurements and to present the results.

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

### Method of assessment
a) Preparing, performing and evaluating the experiments will be considered successfully completed if a Testat (exam) is passed. Experiments that were not successfully completed can be repeated once. Or b) discussion to test the candidate’s understanding of the physics-related contents and results of the experiment (approx. 20 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
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### Additional information
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### Referred to in LPO I
(examination regulations for teaching-degree programmes)

--
**Module title** | **Abbreviation**  
--- | ---  
Particle Radiation Detectors | 11-DTS-111-m01  

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

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

**ECTS**  
4

**Method of grading**  
Numerical grade

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

**Duration**  
1 semester

**Module level**  
Graduate

**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**

Principles of interaction between particles and matter. Particle detectors for space and time measurement, determination of momentum, energy and particle identification. Conception of particle detectors in examples.

**Intended learning outcomes**

The students know the physical principles and the basic structure of particle detectors. They know the functions and applications of different types of detectors, they can explain the measurement of physical values and have basic knowledge of the conception of detector systems.

**Courses**

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

**Method of assessment**

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 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.

Language of assessment: German, English

**Allocation of places**

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**Additional information**

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

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**Contents**


**Intended learning outcomes**

The students have in-depth knowledge of Theoretical Elementary Particle Physics.

**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 can be chosen to earn a bonus)

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 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.

Language of assessment: German, English

**Allocation of places**

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**Additional information**

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Contents


Intended learning outcomes

The students know the principles of the theoretical description of electron-electron interactions in one dimension.

Courses

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

Method of assessment

- a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 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.

Language of assessment: German, English

Allocation of places

- 

Additional information

- 

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

-
### Module title
Professional Specialization FOKUS Physics

### Abbreviation
11-FS-PF-072-m01

### Module coordinator
chairperson of examination committee

### Module offered by
Faculty of Physics and Astronomy

### ECTS
15

### Method of grading
numerical grade

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

### Duration
1 semester

### Module level
graduate

### Other prerequisites
--

### Contents
Introduction to current experimental or theoretical questions of a subdiscipline of Physics with special relevance to the planned topic of the Master's thesis. Summary of the required fundamental topics in a seminar presentation.

### Intended learning outcomes
The students have advanced knowledge of a current experimental or theoretical subdiscipline of Physics with a special relevance to the intended topic of the Master's thesis. They know the current state of research in this area and are able to summarise their knowledge in an oral presentation.

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

### Method of assessment
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)
talk with discussion (approx. 30 to 45 minutes)
Language of assessment: German or English

### Allocation of places
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### Additional information
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### Referred to in LPO I
(examination regulations for teaching-degree programmes)
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Module title | Abbreviation
---|---
Field Theory in Solid State Physics | 11-FTFK-112-m01

Module coordinator | Module offered by
Managing Director of the Institute of Theoretical Physics and Astrophysics | Faculty of Physics and Astronomy

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

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

This will usually be a course on quantum many particle physics using the method of functional integration. An outline could be:
1. Coherent states and review of second quantization
2. The functional integral formalism at finite temperatures $T$
3. Perturbation theory at $T=0$
4. Order parameters and broken symmetry
5. Green's functions
6. The Landau theory of Fermi liquids
7. Further developments

Intended learning outcomes

The students have mastered the principles of quantum field theory in many-particle systems. They are able to apply the acquired methods to current problems of Theoretical Solid-State Physics.

Courses (type, number of weekly contact hours, language — if other than German)
V + R (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 can be chosen to earn a bonus)

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 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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### Module title
FOKUS Research Module

### Abbreviation
11-FM4-112-m01

### Module coordinator
chairperson of examination committee

### Module offered by
Faculty of Physics and Astronomy

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### Duration
1 semester

### Module level
graduate

### Other prerequisites
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### Contents
Specific and advanced knowledge of independent scientific work in a current research area.

### Intended learning outcomes
The students have special and advanced knowledge of independent scientific work in a current research area. They have mastered the basics in theory and practice. They are able to reproduce the acquired knowledge, to apply the acquired methods and to summarise a topic of the selected research area in an oral presentation.

### Courses
(2 weekly contact hours) + Ü/P (1 weekly contact hour), German or English, details on availability to be announced

### FOKUS Kompaktseminar (FOKUS Block Taught Seminar): S (2 weekly contact hours), German or English, details on availability to be announced

### Method of assessment
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

This module has the following assessment components

1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)

2. Seminar: talk (approx. 30 to 45 minutes)

Assessment components 1 and 2 will be offered in German or English. Students must register for assessment components 1 and 2 online (details to be announced). Details on when assessment components will be offered to be announced.

To pass this module, students must pass both assessment component 1 and assessment component 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
---|---
FOKUS Research Module | 11-FM6-112-m01

Module coordinator | Module offered by
chairperson of examination committee | Faculty of Physics and Astronomy

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Duration | Module level |
1 semester | graduate |

Contents
Specific and advanced knowledge of independent scientific work in a current research area.

Intended learning outcomes
The students have special and advanced knowledge of independent scientific work in a current research area. They have mastered the basics in theory and practice. They are able to reproduce the acquired knowledge, to apply the acquired methods and to summarise a topic of the selected research area in an oral presentation.

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

- FOKUS Vorlesung zu aktuellen Forschungsthemen (FOKUS Lecture on Topics in Current Research): V (3 weekly contact hours) + Ü/P (1 weekly contact hour), German or English, details on availability to be announced
- FOKUS Kompaktseminar (FOKUS Block Taught Seminar): S (2 weekly contact hours), German or English, details on availability to be announced

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

This module has the following assessment components
1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)
2. Seminar: talk (approx. 30 to 45 minutes)

Assessment components 1 and 2 will be offered in German or English.
Students must register for assessment components 1 and 2 online (details to be announced). Details on when assessment components will be offered to be announced.
To pass this module, students must pass both assessment component 1 and assessment component 2.

Allocation of places
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Additional information
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**Contents**
Specific and advanced knowledge of independent scientific work in a current research area.

**Intended learning outcomes**
The students have special and advanced knowledge of independent scientific work in a current research area. They have mastered the basics in theory and practice. They are able to reproduce the acquired knowledge, to apply the acquired methods and to summarise a topic of the selected research area in an oral presentation.

**Courses**
- FOKUS Vorlesung zu aktuellen Forschungsthemen (FOKUS Lecture on Topics in Current Research): V (4 weekly contact hours) + Ü/P (2 weekly contact hours), German or English, details on availability to be announced
- FOKUS Kompaktseminar (FOKUS Block Taught Seminar): S (2 weekly contact hours), German or English, details on availability to be announced

**Method of assessment**
This module has the following assessment components
1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)
2. Seminar: talk (approx. 30 to 45 minutes)

Assessment components 1 and 2 will be offered in German or English.
Students must register for assessment components 1 and 2 online (details to be announced).
Details on when assessment components will be offered to be announced.
To pass this module, students must pass both assessment component 1 and assessment component 2.

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

## Abbreviation
11-FM4A-112-m01

## Module coordinator
Chairperson of examination committee

## 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
Graduate

## Other prerequisites

## Contents
Specific and advanced knowledge of independent scientific work in a current research area.

## Intended learning outcomes
The students have special and advanced knowledge of independent scientific work in a current research area. They have mastered the basics in theory and practice. They are able to reproduce the acquired knowledge, to apply the acquired methods and to summarise a topic of the selected research area in an oral presentation.

## Courses

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<th>Type, number of weekly contact hours, language — if other than German</th>
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<td>FOKUS Vorlesung zu aktuellen Forschungsthemen (FOKUS Lecture on Topics in Current Research): V (2 weekly contact hours) + Ü/P (1 weekly contact hour), German or English, details on availability to be announced</td>
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## Method of assessment

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**Contents**

Specific and advanced knowledge of independent scientific work in a current research area.

**Intended learning outcomes**

The students have special and advanced knowledge of independent scientific work in a current research area. They have mastered the basics in theory and practice. They are able to reproduce the acquired knowledge, to apply the acquired methods and to summarise a topic of the selected research area in an oral presentation.

**Courses**

- **FOKUS Vorlesung zu aktuellen Forschungsthemen (FOKUS Lecture on Topics in Current Research):** V (3 weekly contact hours) + Ü/P (1 weekly contact hour), German or English, details on availability to be announced
- **FOKUS Kompaktseminar (FOKUS Block Taught Seminar):** S (2 weekly contact hours), German or English, details on availability to be announced

**Method of assessment**

This module has the following assessment components
1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)
2. Seminar: talk (approx. 30 to 45 minutes)

Assessment components 1 and 2 will be offered in German or English. Students must register for assessment components 1 and 2 online (details to be announced). Details on when assessment components will be offered to be announced.

To pass this module, students must pass both assessment component 1 and assessment component 2.

**Allocation of places**

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**Additional information**

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**Contents**
Specific and advanced knowledge of independent scientific work in a current research area.

**Intended learning outcomes**
The students have special and advanced knowledge of independent scientific work in a current research area. They have mastered the basics in theory and practice. They are able to reproduce the acquired knowledge, to apply the acquired methods and to summarise a topic of the selected research area in an oral presentation.

**Courses** (type, number of weekly contact hours, language — if other than German)
- FOKUS Vorlesung zu aktuellen Forschungsthemen (FOKUS Lecture on Topics in Current Research): V (4 weekly contact hours) + U/P (2 weekly contact hours), German or English, details on availability to be announced
- FOKUS Kompaktseminar (FOKUS Block Taught Seminar): S (2 weekly contact hours), German or English, details on availability to be announced

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)
This module has the following assessment components
1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)
2. Seminar: talk (approx. 30 to 45 minutes)
Assessment components 1 and 2 will be offered in German or English.
Students must register for assessment components 1 and 2 online (details to be announced).
Details on when assessment components will be offered to be announced.
To pass this module, students must pass both assessment component 1 and assessment component 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: FOKUS Research Module Applied Semiconductor Physics and Devices

Abbreviation: 11-FM-SPD-102-m01

Module coordinator: chairperson of examination committee

Module offered by: Faculty of Physics and Astronomy

ECTS: 10

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

Numerical grade: --

Duration: 1 semester

Module level: graduate

Other prerequisites: 11-KM-2

Contents:
Specific and advanced knowledge of independent scientific work in a current research area, especially in the specialist field of Semiconductor Physics and Components, reproduction of knowledge, acquisition of social and methodological competencies. Principles of Semiconductor Physics. Introduction to key theories on semiconductors. Components from the areas of electronics and photonics.

Intended learning outcomes:
The students have special and advanced knowledge of independent scientific work in Applied Semiconductor Physics. They are familiar with the properties of semiconductors, they have gained an overview of the electronic and phononic band structures of important semiconductors and the resulting electronic, optical and thermal properties. They know the realisation possibilities of low-dimensional charge carrier systems on the basis of semiconductors and their technological importance. They have acquired advanced knowledge of a special topic and are able to summarise their knowledge in an oral presentation.

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

Halbleiterphysik und Bauelemente (Applied Semiconductor Physics and Devices): V (3 weekly contact hours) + U/P (1 weekly contact hour), German or English, once a year (winter semester)

Kompaktseminar Halbleiterphysik und Bauelemente (Block Taught Seminar Applied Semiconductor Physics and Devices): S (2 weekly contact hours), German or English, details on availability to be announced (block taught seminar (3 days), usually held during semester break)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

This module has the following assessment components:

1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)

2. Seminar: talk (approx. 30 to 45 minutes)

Assessment components 1 and 2 will be offered in German or English.

Students must register for assessment components 1 and 2 online (details to be announced).

Assessment component 1 will be offered once a year in the winter semester; details on when assessment component 2 will be offered to be announced.

To pass this module, students must pass both assessment component 1 and assessment component 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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**Contents**

Specific and advanced knowledge for independent scientific work in the research area of High-Energy Astrophysics.

**Intended learning outcomes**

The students have special and advanced knowledge of independent scientific work in the field of High-Energy Astrophysics. They have knowledge of cosmology and/or Plasma Astrophysics (cf. modules 11-AKM, 11-APL). They are able to reproduce and summarise the acquired knowledge in a seminar presentation.

**Courses**

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

- Plasma-Astrophysik (Plasma-Astrophysics): V (3 weekly contact hours) + Ü/P (1 weekly contact hour), German or English, once a year (summer semester)
- Kosmologie (Cosmology): V (3 weekly contact hours) + Ü/P (1 weekly contact hour), German or English
- Kompaktseminar Hochenergie-Astrophysik (Block Taught Seminar High Energy Astrophysics): S (2 weekly contact hours), German or English, details on availability to be announced (block taught seminar (3 days), usually held during semester break)

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

This module has the following assessment components

1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)
2. Seminar: talk (approx. 30 to 45 minutes)

Assessment components 1 and 2 will be offered in German or English.

Students must register for assessment components 1 and 2 online (details to be announced).

Details on when assessment component 2 will be offered to be announced.

Lectures and exercises will cover either plasma-astrophysics or cosmology (as announced by or agreed upon with the lecturer).

To pass this module, students must pass both assessment component 1 and assessment component 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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**Contents**

Specific and advanced knowledge for independent scientific work in the research area of High-Energy Astrophysics.

**Intended learning outcomes**

The students have special and advanced knowledge of independent scientific work in the field of High-Energy Astrophysics. They are able to reproduce and summarise the acquired knowledge in an oral presentation. They are able to apply the acquired methods, to conduct and evaluate astrophysical experiments and to present the obtained results.

**Courses**

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

- Plasma-Astrophysik (Plasma-Astrophysics): V (3 weekly contact hours) + Ü/P (1 weekly contact hour), German or English, once a year (summer semester)
- Kosmologie (Cosmology): V (3 weekly contact hours) + Ü/P (1 weekly contact hour), German or English
- Kompaktseminar Hochenergie-Astrophysik (Block Taught Seminar High Energy Astrophysics): S (2 weekly contact hours), German or English, details on availability to be announced (block taught seminar (3 days), usually held during semester break)
- Astrophysikalisches Praktikum (Practical Course Astrophysics): P (4 weekly contact hours)

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

This module has the following assessment components

1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)
2. Seminar: talk (approx. 30 to 45 minutes)
3. Lab course (research project): a) Preparing, performing and evaluating the experiments will be considered successfully completed if a Testat (exam) is passed. Students will be given one opportunity to repeat experiments they did not pass. Or b) discussion to test the students' understanding of the physics-related contents and results of the experiment (approx. 20 minutes).

Assessment components 1 and 2 will be offered in German or English.

Students must register for assessment components 1 through 3 online (details to be announced).

Details on when assessment component 2 will be offered to be announced.

Lectures and exercises will cover either plasma-astrophysics or cosmology (as announced by or agreed upon with the lecturer).

To pass this module, students must pass both assessment component 1 and assessment component 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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**Contents**

Experimental determination of the electronic structure of solids and surfaces: Band dispersion and band gaps, quasiparticles, electronic correlations, etc.

**Intended learning outcomes**

The students know the physical principles and experimental methods of surface spectroscopy. They are able to conduct, evaluate and interpret simple measurements. They have acquired advanced knowledge of a subdiscipline and are able to summarise their knowledge in an oral presentation.

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

Methods in Surface Spectroscopy: V (3 weekly contact hours), usually English, once a year (winter semester)

Kompaktseminar (Block Taught Seminar) Applications of Surface Spectroscopy: S (2 weekly contact hours), German or English, details on availability to be announced (block taught seminar (3 days), usually held during semester break)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

This module has the following assessment components

1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)
2. Seminar: talk (approx. 30 to 45 minutes)

Assessment components 1 and 2 will be offered in German or English.

Students must register for assessment components 1 and 2 online (details to be announced).

Assessment component 1 will be offered once a year in the winter semester; details on when assessment component 2 will be offered to be announced.

To pass this module, students must pass both assessment component 1 and assessment component 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

FOKUS Research Module Methods in Surface Spectroscopy with Mini Research Project

Abbreviation

11-FM-MSS-MF-102-m01

Module coordinator

chairperson of examination committee

Module offered by

Faculty of Physics and Astronomy

ECTS

12

Method of grading

numerical grade

Only after succ. compl. of module(s)

Duration

1 semester

Module level

graduate

Other prerequisites

11-TQM, 11-KM2, 11-FK2 (or 11-T3, 11-E5, 11-E7)

Contents

Experimental determination of the electronic structure of solids and surfaces: Band dispersion and band gaps, quasiparticles, electronic correlations

Intended learning outcomes

The students have gained insights into a modern research area neighbouring on different areas of "Condensed Matter", they have acquired basic knowledge for the application of modern methods of surface spectroscopy (photo emission, Auger spectroscopy, spectroscopy with synchrotron radiation etc.) and are able to interpret and present the results obtained with these methods in a presentation or a poster.

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

Methods in Surface Spectroscopy: V (3 weekly contact hours), usually English, once a year (winter semester)

Kosmologie (Cosmology): V (3 weekly contact hours) + Ü/P (1 weekly contact hour), German or English

Kompaktseminar (Block Taught Seminar) Applications of Surface Spectroscopy: S (2 weekly contact hours), German or English, details on availability to be announced (block taught seminar (3 days), usually held during semester break)

Miniforschungsprojekt zu Surface Spectroscopy (Mini Research Project Surface Spectroscopy): P (2 weekly contact hours)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

This module has the following assessment components

1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)

2. Seminar: talk (approx. 30 to 45 minutes)

3. Research project: project report (approx. 8 pages)

Assessment components 1 through 3 will be offered in German or English.

Students must register for assessment components 1 through 3 online (details to be announced). Assessment component 1 will be offered once a year in the winter semester; details on when assessment components 2 and 3 will be offered to be announced.

To pass this module, students must pass each of the assessment components 1 through 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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### Module title

**FOKUS Research Module with Mini Research Project**

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### Module coordinator

Chairperson of examination committee

### Module offered by

Faculty of Physics and Astronomy

### ECTS

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### Contents

Specific and advanced knowledge of independent scientific work in a current research area.

### Intended learning outcomes

The students have special and advanced knowledge of independent scientific work in a current research area. They have mastered the basics in theory and practice. They are able to reproduce the acquired knowledge, to apply the acquired methods and to summarise a topic of the selected research area in an oral presentation. They are able to successfully implement the acquired methods in a mini research project and to write down the results in a report.

### Courses

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<td>FOKUS Kompaktseminar (FOKUS Block Taught Seminar): S (2 weekly contact hours), German or English, details on availability to be announced</td>
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### Method of assessment

Assessment components 1 and 3 will be offered in German or English.

Students must register for assessment components 1 and 3 online (details to be announced).

To pass this module, students must pass each of the assessment components 1 through 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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Module title | Abbreviation
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FOKUS Research Module with Mini Research Project | 11-FM6-MF-112-m01

Module coordinator | Module offered by
Chairperson of examination committee | Faculty of Physics and Astronomy

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

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

Contents
Specific and advanced knowledge of independent scientific work in a current research area.

Intended learning outcomes
The students have special and advanced knowledge of independent scientific work in a current research area. They have mastered the basics in theory and practice. They are able to reproduce the acquired knowledge, to apply the acquired methods and to summarise a topic of the selected research area in an oral presentation. They are able to successfully implement the acquired methods in a mini research project and to write down the results in a report.

Courses (type, number of weekly contact hours, language — if other than German)
- FOKUS Vorlesung zu aktuellen Forschungsthemen (FOKUS Lecture on Topics in Current Research): V (3 weekly contact hours) + Ü/P (1 weekly contact hour), German or English, details on availability to be announced.
- FOKUS Kompaktseminar (FOKUS Block Taught Seminar): S (2 weekly contact hours), German or English, details on availability to be announced.
- FOKUS Miniforschungsprojekt (FOKUS Mini Research Project): P (2 weekly contact hours), German or English, details on availability to be announced.

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)
This module has the following assessment components:
1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages).
2. Seminar: talk (approx. 30 to 45 minutes).
3. Research project: project report (approx. 8 pages).

Assessment components 1 and 3 will be offered in German or English. Students must register for assessment components 1 and 3 online (details to be announced). Details on when assessment components will be offered to be announced.
To pass this module, students must pass each of the assessment components 1 through 3.

Allocation of places
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Additional information
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**Module coordinator**

chairperson of examination committee

**Module offered by**

Faculty of Physics and Astronomy

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**Contents**

Specific and advanced knowledge of independent scientific work in a current research area.

**Intended learning outcomes**

The students have special and advanced knowledge of independent scientific work in a current research area. They have mastered the basics in theory and practice. They are able to reproduce the acquired knowledge, to apply the acquired methods and to summarise a topic of the selected research area in an oral presentation. They are able to successfully implement the acquired methods in a mini research project and to write down the results in a report.

**Courses**

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

- FOKUS Vorlesung zu aktuellen Forschungsthemen (FOKUS Lecture on Topics in Current Research): V (4 weekly contact hours) + Ü/P (2 weekly contact hours), German or English, details on availability to be announced
- FOKUS Kompaktseminar (FOKUS Block Taught Seminar): S (2 weekly contact hours), German or English, details on availability to be announced
- FOKUS Miniforschungsprojekt (FOKUS Mini Research Project): P (2 weekly contact hours), German or English, details on availability to be announced

**Method of assessment**

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

This module has the following assessment components

1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)
2. Seminar: talk (approx. 30 to 45 minutes)
3. Research project: project report (approx. 8 pages)

Assessment components 1 and 3 will be offered in German or English. Students must register for assessment components 1 and 3 online (details to be announced). Details on when assessment components will be offered to be announced.

To pass this module, students must pass each of the assessment components 1 through 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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### Module title
- **FOKUS Mini Research Project**

### Abbreviation
- `11-FM4A-MF-112-m01`

### Module coordinator
- Chairperson of examination committee

### Module offered by
- Faculty of Physics and Astronomy

### ECTS
- **12**

### Method of grading
- Numerical grade

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

### Duration
- **1 semester**

### Module level
- Graduate

### Other prerequisites
- --

### Contents
Specific and advanced knowledge of independent scientific work in a current research area.

### Intended learning outcomes
The students have special and advanced knowledge of independent scientific work in a current research area. They have mastered the basics in theory and practice. They are able to reproduce the acquired knowledge, to apply the acquired methods and to summarise a topic of the selected research area in an oral presentation. They are able to successfully implement the acquired methods in a mini research project and to write down the results in a report.

### Courses
**FOKUS Vorlesung zu aktuellen Forschungsthemen (FOKUS Lecture on Topics in Current Research):**
- V (2 weekly contact hours), German or English, details on availability to be announced

**FOKUS Kompaktseminar (FOKUS Block Taught Seminar):**
- S (2 weekly contact hours), German or English, details on availability to be announced

**FOKUS Miniforschungsprojekt (FOKUS Mini Research Project):**
- P (2 weekly contact hours), German or English, details on availability to be announced

### Method of assessment
This module has the following assessment components

1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)
2. Seminar: talk (approx. 30 to 45 minutes)
3. Research project: project report (approx. 8 pages)

Assessment components 1 and 3 will be offered in German or English.

Students must register for assessment components 1 and 3 online (details to be announced).

Details on when assessment components will be offered to be announced.

To pass this module, students must pass each of the assessment components 1 through 3.

### Allocation of places
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### Additional information
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**Contents**

Specific and advanced knowledge of independent scientific work in a current research area.

**Intended learning outcomes**

The students have special and advanced knowledge of independent scientific work in a current research area. They have mastered the basics in theory and practice. They are able to reproduce the acquired knowledge, to apply the acquired methods and to summarise a topic of the selected research area in an oral presentation. They are able to successfully implement the acquired methods in a mini research project and to write down the results in a report.

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

- FOKUS Vorlesung zu aktuellen Forschungsthemen (FOKUS Lecture on Topics in Current Research): V (3 weekly contact hours) + Ü/P (1 weekly contact hour), German or English, details on availability to be announced
- FOKUS Kompaktseminar (FOKUS Block Taught Seminar): S (2 weekly contact hours), German or English, details on availability to be announced
- FOKUS Miniforschungsprojekt (FOKUS Mini Research Project): P (2 weekly contact hours), German or English, details on availability to be announced

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

This module has the following assessment components

1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)
2. Seminar: talk (approx. 30 to 45 minutes)
3. Research project: project report (approx. 8 pages)

Assessment components 1 and 3 will be offered in German or English. Students must register for assessment components 1 and 3 online (details to be announced). Details on when assessment components will be offered to be announced. To pass this module, students must pass each of the assessment components 1 through 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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Module title | Abbreviation
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FOKUS Research Module with Mini Research Project | 11-FM8A-MF-112-m01

Module coordinator | Module offered by
chairperson of examination committee | Faculty of Physics and Astronomy

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

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

Contents
Specific and advanced knowledge of independent scientific work in a current research area.

Intended learning outcomes
The students have special and advanced knowledge of independent scientific work in a current research area. They have mastered the basics in theory and practice. They are able to reproduce the acquired knowledge, to apply the acquired methods and to summarise a topic of the selected research area in an oral presentation. They are able to successfully implement the acquired methods in a mini research project and to write down the results in a report.

Courses (type, number of weekly contact hours, language — if other than German)
- FOKUS Vorlesung zu aktuellen Forschungsthemen (FOKUS Lecture on Topics in Current Research): V (4 weekly contact hours) + Ü/P (2 weekly contact hours), German or English, details on availability to be announced
- FOKUS Kompaktseminar (FOKUS Block Taught Seminar): S (2 weekly contact hours), German or English, details on availability to be announced
- FOKUS Miniforschungsprojekt (FOKUS Mini Research Project): P (2 weekly contact hours), German or English, details on availability to be announced

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)
This module has the following assessment components
1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)
2. Seminar: talk (approx. 30 to 45 minutes)
3. Research project: project report (approx. 8 pages)
Assessment components 1 and 3 will be offered in German or English. Students must register for assessment components 1 and 3 online (details to be announced). Details on when assessment components will be offered to be announced. To pass this module, students must pass each of the assessment components 1 through 3.

Allocation of places
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**Contents**

Specific and advanced knowledge of independent scientific work in a current research area, especially in the specialist field of Nano-Optics and Spectroscopy, reproduction of knowledge, acquisition of social and methodological competencies.

**Intended learning outcomes**

The students have special and advanced knowledge of independent scientific work in a current research area, especially in the field of nano-optics and spectroscopy, and are able to reproduce the acquired knowledge, to apply the acquired methods and to summarise a sub-area of the current research area in an oral presentation.

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

- Nano-Optik (Nano-Optics): V (2 weekly contact hours) + Ü/P (1 weekly contact hour), German or English, once a year (summer semester)
- Kompaktseminar Nano-Optik (Block Taught Seminar Nano-Optics): S (2 weekly contact hours), German or English, details on availability to be announced (block taught seminar (3 days), usually held during semester break)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

This module has the following assessment components

1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)
2. Seminar: talk (approx. 30 to 45 minutes)

Assessment components 1 and 2 will be offered in German or English.

Students must register for assessment components 1 and 2 online (details to be announced). Students must meet certain prerequisites to qualify for admission to assessment component 1. The lecturer will inform them about the respective details at the beginning of the course.

Assessment component 1 will be offered once a year in the summer semester; details on when assessment component 2 will be offered to be announced.

To pass this module, students must pass both assessment component 1 and assessment component 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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## Subdivided Module Catalogue for the Subject FOKUS Physics
### Master's with 1 major, 120 ECTS credits

<table>
<thead>
<tr>
<th>Module title</th>
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<tr>
<td>FOKUS Research Module Quantum Transport in Semiconductor Nanostructures</td>
<td>11-FM-QTH-102-m01</td>
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### Module coordinator
chairperson of examination committee

### Module offered by
Faculty of Physics and Astronomy

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### Duration
1 semester

### Contents
Specific and advanced knowledge of independent scientific work in the field of quantum transport. Transport phenomena that cannot be observed in classical electronic switches appear in highly miniaturised electronic components. The research module provides insights into production techniques, characteristics and application fields of modern nanoelectronic components, which function on the basis of ballistic and coherent transport.

### Intended learning outcomes
The students have special and advanced knowledge of independent scientific work in the current research area of quantum transport. They have mastered the basics of electronics of nanostructures in theory and practice. They know functions and applications of respective components and are able to reproduce the acquired knowledge, to apply the acquired methods and to summarise a field of the current research area in an oral presentation.

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

- Quantentransport in Halbleiter-Nanostrukturen (Quantum Transport in Semiconductor Nanostructures): V (3 weekly contact hours) + Ü/P (1 weekly contact hour), German or English, once a year (summer semester)
- Kompaktseminar Quantentransport in Halbleiternanostrukturen (Block Taught Seminar Quantum Transport in Semiconductor Nanostructures): S (2 weekly contact hours), German or English, details on availability to be announced (block taught seminar (3 days), usually held during semester break)

### Method of assessment
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

This module has the following assessment components
1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)
2. Seminar: talk (approx. 30 to 45 minutes)

Assessment components 1 and 2 will be offered in German or English.

Students must register for assessment components 1 and 2 online (details to be announced).

Assessment component 1 will be offered once a year in the summer semester; details on when assessment component 2 will be offered to be announced.

To pass this module, students must pass both assessment component 1 and assessment component 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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**Contents**

Specific and advanced knowledge of independent scientific work in a current research area, especially in the specialist field of Nano-Optics, reproduction of knowledge, acquisition of social and methodological competencies.

**Intended learning outcomes**

The students have special and advanced knowledge of independent scientific work in a current research area, especially in the field of nano-optics, and are able to reproduce the acquired knowledge, to apply the acquired methods and to summarise a sub-area of the current research area in an oral presentation.

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

- Festkörper-Spektroskopie (Solid State Spectroscopy): V (3 weekly contact hours) + Ü/P (1 weekly contact hour), German or English, once a year (summer semester)
- Kompaktseminar Nano-Optik und Spektroskopie (Block Taught Seminar Nano-Optics and Spectroscopy): S (2 weekly contact hours), German or English, details on availability to be announced (block taught seminar (3 days), usually held during semester break)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

This module has the following assessment components

1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)
2. Seminar: talk (approx. 30 to 45 minutes)

Assessment components 1 and 2 will be offered in German or English.

Students must register for assessment components 1 and 2 online (details to be announced).

Assessment component 1 will be offered once a year in the summer semester; details on when assessment component 2 will be offered to be announced.

To pass this module, students must pass both assessment component 1 and assessment component 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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### Contents

Specific and advanced knowledge of independent scientific work in a current research area, especially in the discipline of Astronomy, reproduction of knowledge, acquisition of social and methodological competencies. Application of the acquired professional knowledge and methods to new scientific questions in a mini research project (e.g. experiments, case studies etc.).

### Intended learning outcomes

The students have special and advanced knowledge of independent scientific work in a current research area, especially in the specialist field of Astronomy, and are able to reproduce the acquired knowledge, to apply the acquired methods, to summarise a sub-area of the current research area in an oral presentation and to successfully implement the acquired knowledge and methods in a mini research project.

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

- **FOKUS Einführungsmodul Astronomie (FOKUS Introductory Module Astronomy):** V (3 weekly contact hours) + Ü/P (2 weekly contact hours), German or English, details on availability to be announced
- **FOKUS Kompaktseminar Astronomie (FOKUS Block Taught Seminar Astronomy):** S (2 weekly contact hours), German or English, details on availability to be announced (block taught seminar (3 days), usually held during semester break)

### Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

This module has the following assessment components

1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)
2. Seminar: talk (approx. 30 to 45 minutes)

Assessment components 1 and 2 will be offered in German or English.

Students must register for assessment components 1 and 2 online (details to be announced).

Details on when assessment components 1 and 2 will be offered to be announced.

To pass this module, students must pass both assessment component 1 and assessment component 2.

### Allocation of places

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### Additional information

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**Contents**

Specific and advanced knowledge of independent scientific work in a current research area, especially in the discipline of Didactics, reproduction of knowledge, acquisition of social and methodological competencies. Application of the acquired professional knowledge and methods to new scientific questions in a mini research project (e.g. experiments, case studies etc.).

**Intended learning outcomes**

The students have special and advanced knowledge of independent scientific work in a current research area, especially in the specialist field of Didactics, and are able to reproduce the acquired knowledge, to apply the acquired methods, to summarise a sub-area of the current research area in an oral presentation and to successfully implement the acquired knowledge and methods in a mini research project.

**Courses**

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<tr>
<th>FOKUS Einführungsmodul Didaktik (FOKUS Introductory Module Didactics): V (3 weekly contact hours) + Ü/P (2 weekly contact hours), details on availability to be announced</th>
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<tr>
<td>FOKUS Kompaktseminar Didaktik (FOKUS Block Taught Seminar Didactics): S (2 weekly contact hours), German or English, details on availability to be announced (block taught seminar (3 days), usually held during semester break)</td>
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**Method of assessment**

This module has the following assessment components

1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)
2. Seminar: talk (approx. 30 to 45 minutes)

Assessment components 1 and 2 will be offered in German or English.

Students must register for assessment components 1 and 2 online (details to be announced).

Details on when assessment components 1 and 2 will be offered to be announced.

To pass this module, students must pass both assessment component 1 and assessment component 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

FOKUS Research Module Type VK10E Experimental Physics

Abbreviation

11-FM-VK10E-072-m01

Module coordinator

chairperson of examination committee

Module offered by

Faculty of Physics and Astronomy

ECTS

10

Method of grading

numerical grade

Only after succ. compl. of module(s)

Duration

1 semester

Module level

graduate

Other prerequisites

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Contents

Specific and advanced knowledge of independent scientific work in a current research area, especially in the discipline of Experimental Physics, reproduction of knowledge, acquisition of social and methodological competencies. Application of the acquired professional knowledge and methods to new scientific questions in a mini research project (e.g. experiments, case studies etc.).

Intended learning outcomes

The students have special and advanced knowledge of independent scientific work in a current research area, especially in the specialist field of Experimental Physics, and are able to reproduce the acquired knowledge, to apply the acquired methods, to summarise a sub-area of the current research area in an oral presentation and to successfully implement the acquired knowledge and methods in a mini research project.

Courses

FOKUS Einführungsmodul Experimentelle Physik (FOKUS Introductory Module Experimental Physics): V (3 weekly contact hours) + Ü/P (2 weekly contact hours), details on availability to be announced

FOKUS Kompaktseminar Experimentelle Physik (FOKUS Block Taught Seminar Experimental Physics): S (2 weekly contact hours), German or English, details on availability to be announced (block taught seminar (3 days), usually held during semester break)

Method of assessment

1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)
2. Seminar: talk (approx. 30 to 45 minutes)

Assessment components 1 and 2 will be offered in German or English.

Students must register for assessment components 1 and 2 online (details to be announced).

Details on when assessment components 1 and 2 will be offered to be announced.

To pass this module, students must pass both assessment component 1 and assessment component 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

FOKUS Research Module Type VK10I Interdisciplinary Research Fields

Abbreviation

11-FM-VK10I-072-m01

Module coordinator

chairperson of examination committee

Module offered by

Faculty of Physics and Astronomy

ECTS

Method of grading

Only after succ. compl. of module(s)

10

numerical grade

Duration

Module level

Other prerequisites

1 semester

graduate

Contents

Specific and advanced knowledge of independent scientific work in a current research area, especially in an interdisciplinary subject, reproduction of knowledge, acquisition of social and methodological competencies. Application of the acquired professional knowledge and methods to new scientific questions in a mini research project (e.g. experiments, case studies etc.).

Intended learning outcomes

The students have special and advanced knowledge of independent scientific work in a current research area, especially in an interdisciplinary specialist field, and are able to reproduce the acquired knowledge, to apply the acquired methods, to summarise a sub-area of the current research area in an oral presentation and to successfully implement the acquired knowledge and methods in a mini research project.

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

FOKUS Einführungsmodul Interdisziplinäre Fachgebiete (FOKUS Introductory Module Interdisciplinary Research Fields): V (3 weekly contact hours) + Ü/P (2 weekly contact hours), details on availability to be announced

FOKUS Kompaktseminar Interdisziplinäre Fachgebiete (FOKUS Block Taught Seminar Interdisciplinary Research Fields): S (2 weekly contact hours), German or English, details on availability to be announced (block taught seminar (3 days), usually held during semester break)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

This module has the following assessment components

1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)

2. Seminar: talk (approx. 30 to 45 minutes)

Assessment components 1 and 2 will be offered in German or English.

Students must register for assessment components 1 and 2 online (details to be announced).

Details on when assessment components 1 and 2 will be offered to be announced.

To pass this module, students must pass both assessment component 1 and assessment component 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**  
FKONUS Research Module Type VK10T Theoretical Physics

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**Module coordinator**  
chairperson of examination committee

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

**ECTS**  
10

**Method of grading**  
numerical grade

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

**Module level**  
graduate

**Other prerequisites**  
--

**Contents**
Specific and advanced knowledge of independent scientific work in a current research area, especially in the discipline of Theoretical Physics, reproduction of knowledge, acquisition of social and methodological competencies. Application of the acquired professional knowledge and methods to new scientific questions in a mini research project (e.g. experiments, case studies etc.).

**Intended learning outcomes**
The students have special and advanced knowledge of independent scientific work in a current research area, especially in the specialist field of Theoretical Physics, and are able to reproduce the acquired knowledge, to apply the acquired methods, to summarise a sub-area of the current research area in an oral presentation and to successfully implement the acquired knowledge and methods in a mini research project.

**Courses**

| FOKUS Einführungsmodul Theoretische Physik (FOKUS Introductory Module Theoretical Physics): V (3 weekly contact hours) + Ü/P (2 weekly contact hours), details on availability to be announced |
| FOKUS Kompaktseminar Theoretische Physik (FOKUS Block Taught Seminar Theoretical Physics): S (2 weekly contact hours), German or English, details on availability to be announced (block taught seminar (3 days), usually held during semester break) |

**Method of assessment**
This module has the following assessment components
1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)
2. Seminar: talk (approx. 30 to 45 minutes)

Assessment components 1 and 2 will be offered in German or English.
Students must register for assessment components 1 and 2 online (details to be announced).
Details on when assessment components 1 and 2 will be offered to be announced.
To pass this module, students must pass both assessment component 1 and assessment component 2.

**Allocation of places**  
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**Additional information**  
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**Contents**

Specific and advanced knowledge of independent scientific work in a current research area, especially in the discipline of Astronomy, reproduction of knowledge, acquisition of social and methodological competencies. Application of the acquired professional knowledge and methods to new scientific questions in a mini research project (e.g. experiments, case studies etc.).

**Intended learning outcomes**

The students have special and advanced knowledge of independent scientific work in a current research area, especially in the specialist field of Astronomy, and are able to reproduce the acquired knowledge, to apply the acquired methods, to summarise a sub-area of the current research area in an oral presentation and to successfully implement the acquired knowledge and methods in a mini research project.

**Courses**

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<td>FOKUS Kompaktseminar Astronomie (FOKUS Block Taught Seminar Astronomy): S (2 weekly contact hours), German or English, details on availability to be announced (block taught seminar (3 days), usually held during semester break)</td>
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**Method of assessment**

- Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)
- Seminar: talk (approx. 30 to 45 minutes)

Assessment components 1 and 2 will be offered in German or English.
Students must register for assessment components 1 and 2 online (details to be announced). Details on when assessment components 1 and 2 will be offered to be announced.
To pass this module, students must pass both assessment component 1 and assessment component 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

**FOKUS Research Module Type VK12D Didactics**

### Abbreviation

11-FM-VK12D-072-m01

### Module coordinator

chairperson of examination committee

### Module offered by

Faculty of Physics and Astronomy

### ECTS

12

### Method of grading

numerical grade

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

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### Duration

1 semester

### Module level

graduate

### Other prerequisites

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### Contents

Specific and advanced knowledge of independent scientific work in a current research area, especially in the discipline of Didactics, reproduction of knowledge, acquisition of social and methodological competencies. Application of the acquired professional knowledge and methods to new scientific questions in a mini research project (e.g. experiments, case studies etc.).

### Intended learning outcomes

The students have special and advanced knowledge of independent scientific work in a current research area, especially in the specialist field of Didactics, and are able to reproduce the acquired knowledge, to apply the acquired methods, to summarise a sub-area of the current research area in an oral presentation and to successfully implement the acquired knowledge and methods in a mini research project.

### Courses

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### Method of assessment

This module has the following assessment components

1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)
2. Seminar: talk (approx. 30 to 45 minutes)

Assessment components 1 and 2 will be offered in German or English. Students must register for assessment components 1 and 2 online (details to be announced). Details on when assessment components 1 and 2 will be offered to be announced. To pass this module, students must pass both assessment component 1 and assessment component 2.

### Allocation of places

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### Additional information

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### Referred to in LPO I

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**Contents**

Specific and advanced knowledge of independent scientific work in a current research area, especially in the discipline of Experimental Physics, reproduction of knowledge, acquisition of social and methodological competencies. Application of the acquired professional knowledge and methods to new scientific questions in a mini research project (e.g. experiments, case studies etc.).

**Intended learning outcomes**

The students have special and advanced knowledge of independent scientific work in a current research area, especially in the specialist field of Experimental Physics, and are able to reproduce the acquired knowledge, to apply the acquired methods, to summarise a sub-area of the current research area in an oral presentation and to successfully implement the acquired knowledge and methods in a mini research project.

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

- FOKUS Einführungsmodul Experimentelle Physik (FOKUS Introductory Module Experimental Physics): V (4 weekly contact hours) + Ü/P (2 weekly contact hours), details on availability to be announced
- FOKUS Kompaktseminar Experimentelle Physik (FOKUS Block Taught Seminar Experimental Physics): S (2 weekly contact hours), German or English, details on availability to be announced (block taught seminar (3 days), usually held during semester break)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

This module has the following assessment components

1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)
2. Seminar: talk (approx. 30 to 45 minutes)

Assessment components 1 and 2 will be offered in German or English.

Students must register for assessment components 1 and 2 online (details to be announced).

Details on when assessment components 1 and 2 will be offered to be announced.

To pass this module, students must pass both assessment component 1 and assessment component 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

**FOKUS Research Module Type VK12I Interdisciplinary Research Fields**

### Abbreviation

11-FM-VK12I-072-m01

### Module coordinator

chairperson of examination committee

### Module offered by

Faculty of Physics and Astronomy

### ECTS

12

### Method of grading

numerical grade

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

--

### Duration

1 semester

### Module level

graduate

### Other prerequisites

--

### Contents

Specific and advanced knowledge of independent scientific work in a current research area, especially in an interdisciplinary subject, reproduction of knowledge, acquisition of social and methodological competencies. Application of the acquired professional knowledge and methods to new scientific questions in a mini research project (e.g. experiments, case studies etc.).

### Intended learning outcomes

The students have special and advanced knowledge of independent scientific work in a current research area, especially in an interdisciplinary specialist field, and are able to reproduce the acquired knowledge, to apply the acquired methods, to summarise a sub-area of the current research area in an oral presentation and to successfully implement the acquired knowledge and methods in a mini research project.

### Courses

| FOKUS Einführungsmodul Interdisziplinäre Fachgebiete (FOKUS Introductory Module Interdisciplinary Research Fields): V (4 weekly contact hours) + Ü/P (2 weekly contact hours), details on availability to be announced |
| FOKUS Kompaktseminar Interdisziplinäre Fachgebiete (FOKUS Block Taught Seminar Interdisciplinary Research Fields): S (2 weekly contact hours), German or English, details on availability to be announced (block taught seminar (3 days), usually held during semester break) |

### Method of assessment

This module has the following assessment components

1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)

2. Seminar: talk (approx. 30 to 45 minutes)

Assessment components 1 and 2 will be offered in German or English.

Students must register for assessment components 1 and 2 online (details to be announced). Details on when assessment components 1 and 2 will be offered to be announced.

To pass this module, students must pass both assessment component 1 and assessment component 2.

### Allocation of places

--

### Additional information

--

### Referred to in LPO I

(examination regulations for teaching-degree programmes)

--
### Module title

**FOKUS Research Module Type VK12T Theoretical Physics**

### Abbreviation

11-FM-VK12T-072-m01

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### Module coordinator

chairperson of examination committee

### Module offered by

Faculty of Physics and Astronomy

---

### ECTS

12

### Method of grading

Only after succ. compl. of module(s)

### Numerical grade

---

### Duration

1 semester

### Module level

graduate

### Other prerequisites

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---

### Contents

Specific and advanced knowledge of independent scientific work in a current research area, especially in the discipline of Theoretical Physics, reproduction of knowledge, acquisition of social and methodological competencies. Application of the acquired professional knowledge and methods to new scientific questions in a mini research project (e.g. experiments, case studies etc.).

---

### Intended learning outcomes

The students have special and advanced knowledge of independent scientific work in a current research area, especially in the specialist field of Theoretical Physics, and are able to reproduce the acquired knowledge, to apply the acquired methods, to summarise a sub-area of the current research area in an oral presentation and to successfully implement the acquired knowledge and methods in a mini research project.

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### Method of assessment

**This module has the following assessment components**

1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)

2. Seminar: talk (approx. 30 to 45 minutes)

Assessment components 1 and 2 will be offered in German or English. Students must register for assessment components 1 and 2 online (details to be announced). Details on when assessment components 1 and 2 will be offered to be announced. To pass this module, students must pass both assessment component 1 and assessment component 2.

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### Allocation of places

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### Additional information

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

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Module title
FOKUS Research Module Type VK8A Astronomy

Abbreviation
11-FM-VK8A-072-m01

Module coordinator
chairperson of examination committee

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
graduate

Other prerequisites
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Contents
Specific and advanced knowledge of independent scientific work in a current research area, especially in the discipline of Astronomy, reproduction of knowledge, acquisition of social and methodological competencies. Application of the acquired professional knowledge and methods to new scientific questions in a mini research project (e.g. experiments, case studies etc.).

Intended learning outcomes
The students have special and advanced knowledge of independent scientific work in a current research area, especially in the specialist field of Astronomy, and are able to reproduce the acquired knowledge, to apply the acquired methods, to summarise a sub-area of the current research area in an oral presentation and to successfully implement the acquired knowledge and methods in a mini research project.

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

- FOKUS Einführungsmodul Astronomie (FOKUS Introductory Module Astronomy): V (2 weekly contact hours) + Ü/P (1 weekly contact hour), details on availability to be announced
- FOKUS Kompaktseminar Astronomie (FOKUS Block Taught Seminar Astronomy): S (2 weekly contact hours), German or English, details on availability to be announced (block taught seminar (3 days), usually held during semester break)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

This module has the following assessment components
1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)
2. Seminar: talk (approx. 30 to 45 minutes)

Assessment components 1 and 2 will be offered in German or English.
Students must register for assessment components 1 and 2 online (details to be announced).
Details on when assessment components 1 and 2 will be offered to be announced.
To pass this module, students must pass both assessment component 1 and assessment component 2.

Allocation of places
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Additional information
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**Module coordinator**

chairperson of examination committee

**Module offered by**

Faculty of Physics and Astronomy

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**Duration**

1 semester graduate

**Other prerequisites**

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**Contents**

Specific and advanced knowledge of independent scientific work in a current research area, especially in the discipline of Didactics, reproduction of knowledge, acquisition of social and methodological competencies. Application of the acquired professional knowledge and methods to new scientific questions in a mini research project (e.g. experiments, case studies etc.).

**Intended learning outcomes**

The students have special and advanced knowledge of independent scientific work in a current research area, especially in the specialist field of Didactics, and are able to reproduce the acquired knowledge, to apply the acquired methods, to summarise a sub-area of the current research area in an oral presentation and to successfully implement the acquired knowledge and methods in a mini research project.

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**Method of assessment**

This module has the following assessment components

1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)
2. Seminar: talk (approx. 30 to 45 minutes)

Assessment components 1 and 2 will be offered in German or English.

Students must register for assessment components 1 and 2 online (details to be announced).

Details on when assessment components 1 and 2 will be offered to be announced.

To pass this module, students must pass both assessment component 1 and assessment component 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

**FOKUS Research Module Type VK8E Experimental Physics**

### Abbreviation

11-FM-VK8E-072-m01

### Module coordinator

Chairperson of examination committee

### Module offered by

Faculty of Physics and Astronomy

### ECTS

8

### Method of grading

Numerical grade

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

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### Duration

1 semester

### Module level

Graduate

### Other prerequisites

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### Contents

Specific and advanced knowledge of independent scientific work in a current research area, especially in the discipline of Experimental Physics, reproduction of knowledge, acquisition of social and methodological competencies. Application of the acquired professional knowledge and methods to new scientific questions in a mini research project (e.g. experiments, case studies etc.).

### Intended learning outcomes

The students have special and advanced knowledge of independent scientific work in a current research area, especially in the specialist field of Experimental Physics, and are able to reproduce the acquired knowledge, to apply the acquired methods, to summarise a sub-area of the current research area in an oral presentation and to successfully implement the acquired knowledge and methods in a mini research project.

### Courses

**FOKUS Einführungsmodul Experimentelle Physik** (FOKUS Introductory Module Experimental Physics): V (2 weekly contact hours) + Ü/P (1 weekly contact hour), details on availability to be announced

**FOKUS Kompaktseminar Experimentelle Physik** (FOKUS Block Taught Seminar Experimental Physics): S (2 weekly contact hours), German or English, details on availability to be announced (block taught seminar (3 days), usually held during semester break)

### Method of assessment

This module has the following assessment components

1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)

2. Seminar: talk (approx. 30 to 45 minutes)

Assessment components 1 and 2 will be offered in German or English.

Students must register for assessment components 1 and 2 online (details to be announced).

Details on when assessment components 1 and 2 will be offered to be announced.

To pass this module, students must pass both assessment component 1 and assessment component 2.

### Allocation of places

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### Additional information

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**Contents**

Specific and advanced knowledge of independent scientific work in a current research area, especially in an interdisciplinary subject, reproduction of knowledge, acquisition of social and methodological competencies. Application of the acquired professional knowledge and methods to new scientific questions in a mini research project (e.g. experiments, case studies etc.).

**Intended learning outcomes**

The students have special and advanced knowledge of independent scientific work in a current research area, especially in an interdisciplinary specialist field, and are able to reproduce the acquired knowledge, to apply the acquired methods, to summarise a sub-area of the current research area in an oral presentation and to successfully implement the acquired knowledge and methods in a mini research project.

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

- FOKUS Einführungsmodul Interdisziplinäre Fachgebiete (FOKUS Introductory Module Interdisciplinary Research Fields): V (2 weekly contact hours) + Ü/P (1 weekly contact hour), details on availability to be announced
- FOKUS Kompaktseminar Interdisziplinäre Fachgebiete (FOKUS Block Taught Seminar Interdisciplinary Research Fields): S (2 weekly contact hours), German or English, details on availability to be announced (block taught seminar (3 days), usually held during semester break)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

This module has the following assessment components
1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)
2. Seminar: talk (approx. 30 to 45 minutes)

Assessment components 1 and 2 will be offered in German or English.
Students must register for assessment components 1 and 2 online (details to be announced).
Details on when assessment components 1 and 2 will be offered to be announced.
To pass this module, students must pass both assessment component 1 and assessment component 2.

**Allocation of places**

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**Additional information**

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### Contents
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### Intended learning outcomes
The students have special and advanced knowledge of independent scientific work in a current research area, especially in the specialist field of Theoretical Physics, and are able to reproduce the acquired knowledge, to apply the acquired methods, to summarise a sub-area of the current research area in an oral presentation and to successfully implement the acquired knowledge and methods in a mini research project.

### Courses
- **FOKUS Einführungsmodul Theoretische Physik (FOKUS Introductory Module Theoretical Physics)**: V (2 weekly contact hours) + Ü/P (1 weekly contact hour), details on availability to be announced
- **FOKUS Kompaktseminar Theoretische Physik (FOKUS Block Taught Seminar Theoretical Physics)**: S (2 weekly contact hours), German or English, details on availability to be announced (block taught seminar (3 days), usually held during semester break)

### Method of assessment
This module has the following assessment components
1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)
2. Seminar: talk (approx. 30 to 45 minutes)

Assessment components 1 and 2 will be offered in German or English.

Students must register for assessment components 1 and 2 online (details to be announced).

Details on when assessment components 1 and 2 will be offered to be announced.

To pass this module, students must pass both assessment component 1 and assessment component 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)
Module title
FOKUS Research Module Type VK9A Astronomy

Abbreviation
11-FM-VK9A-072-m01

Module coordinator
chairperson of examination committee

Module offered by
Faculty of Physics and Astronomy

ECTS
9

Method of grading
numerical grade

Duration
1 semester

Module level
graduate

Other prerequisites
--

Contents
Specific and advanced knowledge of independent scientific work in a current research area, especially in the discipline of Astronomy, reproduction of knowledge, acquisition of social and methodological competencies. Application of the acquired professional knowledge and methods to new scientific questions in a mini research project (e.g. experiments, case studies etc.).

Intended learning outcomes
The students have special and advanced knowledge of independent scientific work in a current research area, especially in the specialist field of Astronomy, and are able to reproduce the acquired knowledge, to apply the acquired methods, to summarise a sub-area of the current research area in an oral presentation and to successfully implement the acquired knowledge and methods in a mini research project.

Courses
FOKUS Einführungsmodul Astronomie (FOKUS Introductory Module Astronomy): V (3 weekly contact hours) + Ü/P (1 weekly contact hour), details on availability to be announced
FOKUS Kompaktseminar Astronomie (FOKUS Block Taught Seminar Astronomy): S (2 weekly contact hours), German or English, details on availability to be announced (block taught seminar (3 days), usually held during semester break)

Method of assessment
This module has the following assessment components
1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)
2. Seminar: talk (approx. 30 to 45 minutes)

Assessment components 1 and 2 will be offered in German or English. Students must register for assessment components 1 and 2 online (details to be announced). Details on when assessment components 1 and 2 will be offered to be announced. To pass this module, students must pass both assessment component 1 and assessment component 2.

Allocation of places
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Additional information
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**Module coordinator**
chairperson of examination committee

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

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**Contents**
Specific and advanced knowledge of independent scientific work in a current research area, especially in the discipline of Didactics, reproduction of knowledge, acquisition of social and methodological competencies. Application of the acquired professional knowledge and methods to new scientific questions in a mini research project (e.g. experiments, case studies etc.).

**Intended learning outcomes**
The students have special and advanced knowledge of independent scientific work in a current research area, especially in the specialist field of Didactics, and are able to reproduce the acquired knowledge, to apply the acquired methods, to summarise a sub-area of the current research area in an oral presentation and to successfully implement the acquired knowledge and methods in a mini research project.

**Courses** (type, number of weekly contact hours, language — if other than German)
- FOKUS Einführungsmodul Didaktik (FOKUS Introductory Module Didactics): V (3 weekly contact hours) + Ü/P (1 weekly contact hour), details on availability to be announced
- FOKUS Kompaktseminar Didaktik (FOKUS Block Taught Seminar Didactics): S (2 weekly contact hours), German or English, details on availability to be announced (block taught seminar (3 days), usually held during semester break)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)
This module has the following assessment components
1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)
2. Seminar: talk (approx. 30 to 45 minutes)

Assessment components 1 and 2 will be offered in German or English.
Students must register for assessment components 1 and 2 online (details to be announced). Details on when assessment components 1 and 2 will be offered to be announced.
To pass this module, students must pass both assessment component 1 and assessment component 2.

**Allocation of places**
--

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

**FOKUS Research Module Type VK9E Experimental Physics**

| Abbreviation | 11-FM-VK9E-072-m01 |

## Module coordinator

chairperson of examination committee

## Module offered by

Faculty of Physics and Astronomy

## ECTS

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## Duration

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Specific and advanced knowledge of independent scientific work in a current research area, especially in the discipline of Experimental Physics, reproduction of knowledge, acquisition of social and methodological competencies. Application of the acquired professional knowledge and methods to new scientific questions in a mini research project (e.g. experiments, case studies etc.).

## Intended learning outcomes

The students have special and advanced knowledge of independent scientific work in a current research area, especially in the specialist field of Experimental Physics, and are able to reproduce the acquired knowledge, to apply the acquired methods, to summarise a sub-area of the current research area in an oral presentation and to successfully implement the acquired knowledge and methods in a mini research project.

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## Method of assessment

This module has the following assessment components

1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)

2. Seminar: talk (approx. 30 to 45 minutes)

Assessment components 1 and 2 will be offered in German or English.

Students must register for assessment components 1 and 2 online (details to be announced).

Details on when assessment components 1 and 2 will be offered to be announced.

To pass this module, students must pass both assessment component 1 and assessment component 2.
Module title | FOKUS Research Module Type VK9I Interdisciplinary Research Fields
---|---
Abbreviation | 11-FM-VK9I-072-m01

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Contents

Specific and advanced knowledge of independent scientific work in a current research area, especially in an interdisciplinary subject, reproduction of knowledge, acquisition of social and methodological competencies. Application of the acquired professional knowledge and methods to new scientific questions in a mini research project (e.g. experiments, case studies etc.).

Intended learning outcomes

The students have special and advanced knowledge of independent scientific work in a current research area, especially in an interdisciplinary specialist field, and are able to reproduce the acquired knowledge, to apply the acquired methods, to summarise a sub-area of the current research area in an oral presentation and to successfully implement the acquired knowledge and methods in a mini research project.

Courses

| FOKUS Einführungsmodul Interdisziplinäre Fachgebiete (FOKUS Introductory Module Interdisciplinary Research Fields): V (3 weekly contact hours) + Ü/P (1 weekly contact hour), details on availability to be announced |
| FOKUS Kompaktseminar Interdisziplinäre Fachgebiete (FOKUS Block Taught Seminar Interdisciplinary Research Fields): S (2 weekly contact hours), German or English, details on availability to be announced (block taught seminar (3 days), usually held during semester break) |

Method of assessment

This module has the following assessment components

1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)
2. Seminar: talk (approx. 30 to 45 minutes)

Assessment components 1 and 2 will be offered in German or English. Students must register for assessment components 1 and 2 online (details to be announced). Details on when assessment components 1 and 2 will be offered to be announced. To pass this module, students must pass both assessment component 1 and assessment component 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

FOKUS Research Module Type VK9T Theoretical Physics

### Abbreviation

11-FM-VK9T-072-m01

## Module coordinator

chairperson of examination committee

## Module offered by

Faculty of Physics and Astronomy

## ECTS

9

## Method of grading

Numerical grade

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

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## Duration

1 semester

## Module level

Graduate

## Other prerequisites

--

## Contents

Specific and advanced knowledge of independent scientific work in a current research area, especially in the discipline of Theoretical Physics, reproduction of knowledge, acquisition of social and methodological competencies. Application of the acquired professional knowledge and methods to new scientific questions in a mini research project (e.g. experiments, case studies etc.).

## Intended learning outcomes

The students have special and advanced knowledge of independent scientific work in a current research area, especially in the specialist field of Theoretical Physics, and are able to reproduce the acquired knowledge, to apply the acquired methods, to summarise a sub-area of the current research area in an oral presentation and to successfully implement the acquired knowledge and methods in a mini research project.

## Courses

**FOKUS Einführungsmodul Theoretische Physik** (FOKUS Introductory Module Theoretical Physics): V (3 weekly contact hours) + Ü/P (1 weekly contact hour), details on availability to be announced

**FOKUS Kompaktseminar Theoretische Physik** (FOKUS Block Taught Seminar Theoretical Physics): S (2 weekly contact hours), German or English, details on availability to be announced (block taught seminar (3 days), usually held during semester break)

## Method of assessment

This module has the following assessment components

1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)

2. Seminar: talk (approx. 30 to 45 minutes)

Assessment components 1 and 2 will be offered in German or English.

Students must register for assessment components 1 and 2 online (details to be announced).

Details on when assessment components 1 and 2 will be offered to be announced.

To pass this module, students must pass both assessment component 1 and assessment component 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)
Module title: FOKUS Research Module Type VKM12A Astronomy
Abbreviation: 11-FM-VMK12A-072-m01

Module coordinator: chairperson of examination committee
Module offered by: Faculty of Physics and Astronomy

ECTS: 12
Method of grading: Only after succ. compl. of module(s)

Duration: 1 semester
Module level: graduate

Contents:
Specific and advanced knowledge of independent scientific work in a current research area, especially in the discipline of Astronomy, reproduction of knowledge, acquisition of social and methodological competencies. Application of the acquired professional knowledge and methods to new scientific questions in a mini research project (e.g. experiments, case studies etc.).

Intended learning outcomes:
The students have special and advanced knowledge of independent scientific work in a current research area, especially in the specialist field of Astronomy, and are able to reproduce the acquired knowledge, to apply the acquired methods, to summarise a sub-area of the current research area in an oral presentation and to successfully implement the acquired knowledge and methods in a mini research project.

Courses (type, number of weekly contact hours, language — if other than German):
- FOKUS Einführungsmodul Astronomie (FOKUS Introductory Module Astronomy): V (2 weekly contact hours) + Ü/P (1 weekly contact hour), details on availability to be announced
- FOKUS Kompaktseminar Astronomie (FOKUS Block Taught Seminar Astronomy): S (2 weekly contact hours), German or English, details on availability to be announced (block taught seminar (3 days), usually held during semester break)
- FOKUS Miniforschungsprojekt Astronomie (FOKUS Mini Research Project Astronomy): P (2 weekly contact hours), German or English, details on availability to be announced (approx. 3 weeks, part time)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus):
This module has the following assessment components
1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)
2. Seminar: talk (approx. 30 to 45 minutes)
3. Research project: project report (approx. 8 pages)

Assessment components 1 through 3 will be offered in German or English. Students must register for assessment components 1 through 3 online (details to be announced). Details on when assessment components 1 through 3 will be offered to be announced. To pass this module, students must pass each of the assessment components 1 through 3.

Allocation of places:
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Additional information:
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**Contents**

Specific and advanced knowledge of independent scientific work in a current research area, especially in the discipline of Didactics, reproduction of knowledge, acquisition of social and methodological competencies. Application of the acquired professional knowledge and methods to new scientific questions in a mini research project (e.g. experiments, case studies etc.).

**Intended learning outcomes**

The students have special and advanced knowledge of independent scientific work in a current research area, especially in the specialist field of Didactics, and are able to reproduce the acquired knowledge, to apply the acquired methods, to summarise a sub-area of the current research area in an oral presentation and to successfully implement the acquired knowledge and methods in a mini research project.

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

- **FOKUS Einführungsmodul Didaktik** (FOKUS Introductory Module Didactics): V (2 weekly contact hours) + Ü/P (1 weekly contact hour), details on availability to be announced
- **FOKUS Kompaktseminar Didaktik** (FOKUS Block Taught Seminar Didactics): S (2 weekly contact hours), German or English, details on availability to be announced (block taught seminar (3 days), usually held during semester break)
- **FOKUS Miniforschungsprojekt Didaktik** (FOKUS Mini Research Project Didactics): P (2 weekly contact hours), German or English, details on availability to be announced (approx. 3 weeks, part time)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

This module has the following assessment components

1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)
2. Seminar: talk (approx. 30 to 45 minutes)
3. Research project: project report (approx. 8 pages)

Assessment components 1 through 3 will be offered in German or English.

Students must register for assessment components 1 through 3 online (details to be announced). Details on when assessment components 1 through 3 will be offered to be announced.

To pass this module, students must pass each of the assessment components 1 through 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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**Contents**

Specific and advanced knowledge of independent scientific work in a current research area, especially in the discipline of Experimental Physics, reproduction of knowledge, acquisition of social and methodological competencies. Application of the acquired professional knowledge and methods to new scientific questions in a mini research project (e.g. experiments, case studies etc.).

**Intended learning outcomes**

The students have special and advanced knowledge of independent scientific work in a current research area, especially in the specialist field of Experimental Physics, and are able to reproduce the acquired knowledge, to apply the acquired methods, to summarise a sub-area of the current research area in an oral presentation and to successfully implement the acquired knowledge and methods in a mini research project.

**Courses**

*FOKUS Einführungsmodul Experimentelle Physik (FOKUS Introductory Module Experimental Physics):* V (2 weekly contact hours) + Ü/P (1 weekly contact hour), details on availability to be announced

*FOKUS Kompaktseminar Experimentelle Physik (FOKUS Block Taught Seminar Experimental Physics):* S (2 weekly contact hours), German or English, details on availability to be announced (block taught seminar (3 days), usually held during semester break)

*FOKUS Miniforschungsprojekt Experimentelle Physik (FOKUS Mini Research Project Experimental Physics):* P (2 weekly contact hours), German or English, details on availability to be announced (approx. 3 weeks, part time)

**Method of assessment**

This module has the following assessment components

1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)

2. Seminar: talk (approx. 30 to 45 minutes)

3. Research project: project report (approx. 8 pages)

Assessment components 1 through 3 will be offered in German or English.

Students must register for assessment components 1 through 3 online (details to be announced).

Details on when assessment components 1 through 3 will be offered to be announced.

To pass this module, students must pass each of the assessment components 1 through 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)
### Module title
FOKUS Research Module Type VMK12l Interdisciplinary Research Fields

### Abbreviation
11-FM-VMK12l-072-m01

### Module coordinator
chairperson of examination committee

### Module offered by
Faculty of Physics and Astronomy

### ECTS
12

### Method of grading
Numerical grade

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

### Duration
1 semester

### Module level
Graduate

### Other prerequisites
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### Contents
Specific and advanced knowledge of independent scientific work in a current research area, especially in interdisciplinary subjects, reproduction of knowledge, acquisition of social and methodological competencies. Application of the acquired professional knowledge and methods to new scientific questions in a mini research project (e.g. experiments, case studies etc.).

### Intended learning outcomes
The students have special and advanced knowledge of independent scientific work in a current research area, especially in interdisciplinary specialist fields, and are able to reproduce the acquired knowledge, to apply the acquired methods, to summarise a sub-area of the current research area in an oral presentation and to successfully implement the acquired knowledge and methods in a mini research project.

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

- **FOKUS Einführungsmodul Interdisziplinäre Fachgebiete (FOKUS Introductory Module Interdisciplinary Research Fields):** V (2 weekly contact hours) + Ü/P (1 weekly contact hour), details on availability to be announced
- **FOKUS Kompaktseminar Interdisziplinäre Fachgebiete (FOKUS Block Taught Seminar Interdisciplinary Research Fields):** S (2 weekly contact hours), German or English, details on availability to be announced (block taught seminar (3 days), usually held during semester break)
- **FOKUS Miniforschungsprojekt Interdisziplinäre Fachgebiete (FOKUS Mini Research Project Interdisciplinary Research Fields):** P (2 weekly contact hours), German or English, details on availability to be announced (approx. 3 weeks, part time)

### Method of assessment
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

This module has the following assessment components
1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)
2. Seminar: talk (approx. 30 to 45 minutes)
3. Research project: project report (approx. 8 pages)

Assessment components 1 through 3 will be offered in German or English. Students must register for assessment components 1 through 3 online (details to be announced). Details on when assessment components 1 through 3 will be offered to be announced.

To pass this module, students must pass each of the assessment components 1 through 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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Module title
FOKUS Research Module Type VKM12T Theoretical Physics

Abbreviation
11-FM-VMK12T-072-m01

Module coordinator
chairperson of examination committee

Module offered by
Faculty of Physics and Astronomy

ECTS
12

Method of grading
numerical grade

Only after succ. compl. of module(s)

Duration
1 semester

Module level
graduate

Other prerequisites
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Contents
Specific and advanced knowledge of independent scientific work in a current research area, especially in the discipline of Theoretical Physics, reproduction of knowledge, acquisition of social and methodological competencies. Application of the acquired professional knowledge and methods to new scientific questions in a mini research project (e.g. experiments, case studies etc.).

Intended learning outcomes
The students have special and advanced knowledge of independent scientific work in a current research area, especially in the specialist field of Theoretical Physics, and are able to reproduce the acquired knowledge, to apply the acquired methods, to summarise a sub-area of the current research area in an oral presentation and to successfully implement the acquired knowledge and methods in a mini research project.

Courses
(type, number of weekly contact hours, language — if other than German)
FOKUS Einführungsmodul Theoretische Physik (FOKUS Introductory Module Theoretical Physics): V (2 weekly contact hours) + Ü/P (1 weekly contact hour), details on availability to be announced
FOKUS Kompaktseminar Theoretische Physik (FOKUS Block Taught Seminar Theoretical Physics): S (2 weekly contact hours), German or English, details on availability to be announced (block taught seminar 3 days, usually held during semester break)
FOKUS Miniforschungsprojekt Theoretische Physik (FOKUS Mini Research Project Theoretical Physics): P (2 weekly contact hours), German or English, details on availability to be announced (approx. 3 weeks, part time)

Method of assessment
(type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)
This module has the following assessment components
1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)
2. Seminar: talk (approx. 30 to 45 minutes)
3. Research project: project report (approx. 8 pages)

Assessment components 1 through 3 will be offered in German or English. Students must register for assessment components 1 through 3 online (details to be announced). Details on when assessment components 1 through 3 will be offered to be announced. To pass this module, students must pass each of the assessment components 1 through 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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Module title: FOKUS Research Module Type VKM13A Astronomy
Abbreviation: 11-FM-VMK13A-072-m01

Module coordinator: chairperson of examination committee
Module offered by: Faculty of Physics and Astronomy

ECTS: 13
Method of grading: numerical grade
Only after succ. compl. of module(s)

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

Contents:
Specific and advanced knowledge of independent scientific work in a current research area, especially in the discipline of Astronomy, reproduction of knowledge, acquisition of social and methodological competencies. Application of the acquired professional knowledge and methods to new scientific questions in a mini research project (e.g. experiments, case studies etc.).

Intended learning outcomes:
The students have special and advanced knowledge of independent scientific work in a current research area, especially in the specialist field of Astronomy, and are able to reproduce the acquired knowledge, to apply the acquired methods, to summarise a sub-area of the current research area in an oral presentation and to successfully implement the acquired knowledge and methods in a mini research project.

Courses (type, number of weekly contact hours, language — if other than German):
- FOKUS Einführungsmodul Astronomie (FOKUS Introductory Module Astronomy): V (3 weekly contact hours) + Ü/P (1 weekly contact hour), details on availability to be announced
- FOKUS Kompaktseminar Astronomie (FOKUS Block Taught Seminar Astronomy): S (2 weekly contact hours), German or English, details on availability to be announced (block taught seminar (3 days), usually held during semester break)
- FOKUS Miniforschungsprojekt Astronomie (FOKUS Mini Research Project Astronomy): P (2 weekly contact hours), German or English, details on availability to be announced (approx. 3 weeks, part time)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus):
This module has the following assessment components
1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)
2. Seminar: talk (approx. 30 to 45 minutes)
3. Research project: project report (approx. 8 pages)

Assessment components 1 through 3 will be offered in German or English.
Students must register for assessment components 1 through 3 online (details to be announced). Details on when assessment components 1 through 3 will be offered to be announced.
To pass this module, students must pass each of the assessment components 1 through 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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Module title | Abbreviation
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FOKUS Research Module Type VMK13D Didactics | 11-FM-VMK13D-072-m01

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

Contents

Specific and advanced knowledge of independent scientific work in a current research area, especially in the discipline of Didactics, reproduction of knowledge, acquisition of social and methodological competencies. Application of the acquired professional knowledge and methods to new scientific questions in a mini research project (e.g. experiments, case studies etc.).

Intended learning outcomes

The students have special and advanced knowledge of independent scientific work in a current research area, especially in the specialist field of Didactics, and are able to reproduce the acquired knowledge, to apply the acquired methods, to summarise a sub-area of the current research area in an oral presentation and to successfully implement the acquired knowledge and methods in a mini research project.

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

- FOKUS Einführungsmodul Didaktik (FOKUS Introductory Module Didactics): V (3 weekly contact hours) + Ü/P (1 weekly contact hour), details on availability to be announced
- FOKUS Kompaktseminar Didaktik (FOKUS Block Taught Seminar Didactics): S (2 weekly contact hours), German or English, details on availability to be announced (block taught seminar (3 days), usually held during semester break)
- FOKUS Miniforschungsprojekt Didaktik (FOKUS Mini Research Project Didactics): P (2 weekly contact hours), German or English, details on availability to be announced (approx. 3 weeks, part time)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

This module has the following assessment components
1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)
2. Seminar: talk (approx. 30 to 45 minutes)
3. Research project: project report (approx. 8 pages)

Assessment components 1 through 3 will be offered in German or English. Students must register for assessment components 1 through 3 online (details to be announced). Details on when assessment components 1 through 3 will be offered to be announced. To pass this module, students must pass each of the assessment components 1 through 3.

Allocation of places

Additional information

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

FOKUS Research Module Type VMK13E Experimental Physics

Abbreviation

11-FM-VMK13E-072-m01

Module coordinator

chairperson of examination committee

Module offered by

Faculty of Physics and Astronomy

ECTS

Method of grading

Only after succ. compl. of module(s)

13

numerical grade

- -

Duration

Module level

Other prerequisites

1 semester

graduate

- -

Contents

Specific and advanced knowledge of independent scientific work in a current research area, especially in the discipline of Experimental Physics, reproduction of knowledge, acquisition of social and methodological competencies. Application of the acquired professional knowledge and methods to new scientific questions in a mini research project (e.g. experiments, case studies etc.).

Intended learning outcomes

The students have special and advanced knowledge of independent scientific work in a current research area, especially in the specialist field of Experimental Physics, and are able to reproduce the acquired knowledge, to apply the acquired methods, to summarise a sub-area of the current research area in an oral presentation and to successfully implement the acquired knowledge and methods in a mini research project.

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

FOKUS Einführungsmodul Experimentelle Physik (FOKUS Introductory Module Experimental Physics): V (3 weekly contact hours) + Ü/P (1 weekly contact hour), details on availability to be announced

FOKUS Kompaktseminar Experimentelle Physik (FOKUS Block Taught Seminar Experimental Physics): S (2 weekly contact hours), German or English, details on availability to be announced (block taught seminar (3 days), usually held during semester break)

FOKUS Miniforschungsprojekt Experimentelle Physik (FOKUS Mini Research Project Experimental Physics): P (2 weekly contact hours), German or English, details on availability to be announced (approx. 3 weeks, part time)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

This module has the following assessment components
1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)
2. Seminar: talk (approx. 30 to 45 minutes)
3. Research project: project report (approx. 8 pages)

Assessment components 1 through 3 will be offered in German or English. Students must register for assessment components 1 through 3 online (details to be announced). Details on when assessment components 1 through 3 will be offered to be announced.

To pass this module, students must pass each of the assessment components 1 through 3.

Allocation of places

- -

Additional information

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

- -
**Module title**
FOKUS Research Module Type VMK13I Interdisciplinary Research Fields

**Abbreviation**
11-FM-VMK13I-072-m01

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**Contents**
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**Intended learning outcomes**
The students have special and advanced knowledge of independent scientific work in a current research area, especially in interdisciplinary specialist fields, and are able to reproduce the acquired knowledge, to apply the acquired methods, to summarise a sub-area of the current research area in an oral presentation and to successfully implement the acquired knowledge and methods in a mini research project.

**Courses** (type, number of weekly contact hours, language — if other than German)
- FOKUS Einführungsmodul Interdisziplinäre Fachgebiete (FOKUS Introductory Module Interdisciplinary Research Fields): V (3 weekly contact hours) + Ü/P (1 weekly contact hour), details on availability to be announced
- FOKUS Kompaktseminar Interdisziplinäre Fachgebiete (FOKUS Block Taught Seminar Interdisciplinary Research Fields): S (2 weekly contact hours), German or English, details on availability to be announced (block taught seminar (3 days), usually held during semester break)
- FOKUS Miniforschungsprojekt Interdisziplinäre Fachgebiete (FOKUS Mini Research Project Interdisciplinary Research Fields): P (2 weekly contact hours), German or English, details on availability to be announced (approx. 3 weeks, part time)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)
This module has the following assessment components
1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)
2. Seminar: talk (approx. 30 to 45 minutes)
3. Research project: project report (approx. 8 pages)

Assessment components 1 through 3 will be offered in German or English. Students must register for assessment components 1 through 3 online (details to be announced). Details on when assessment components 1 through 3 will be offered to be announced. To pass this module, students must pass each of the assessment components 1 through 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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Module title | Abbreviation
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FOKUS Research Module Type VKM13T Theoretical Physics | 11-FM-VMK13T-072-m01

Module coordinator | Module offered by
---|---
chairperson of examination committee | Faculty of Physics and Astronomy

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

Contents
Specific and advanced knowledge of independent scientific work in a current research area, especially in the discipline of Theoretical Physics, reproduction of knowledge, acquisition of social and methodological competencies. Application of the acquired professional knowledge and methods to new scientific questions in a mini research project (e.g. experiments, case studies etc.).

Intended learning outcomes
The students have special and advanced knowledge of independent scientific work in a current research area, especially in the specialist field of Theoretical Physics, and are able to reproduce the acquired knowledge, to apply the acquired methods, to summarise a sub-area of the current research area in an oral presentation and to successfully implement the acquired knowledge and methods in a mini research project.

Courses (type, number of weekly contact hours, language — if other than German)
- FOKUS Einführungsmodul Theoretische Physik (FOKUS Introductory Module Theoretical Physics): V (3 weekly contact hours) + Ü/P (1 weekly contact hour), details on availability to be announced
- FOKUS Kompaktseminar Theoretische Physik (FOKUS Block Taught Seminar Theoretical Physics): S (2 weekly contact hours), German or English, details on availability to be announced (block taught seminar (3 days), usually held during semester break)
- FOKUS Miniforschungsprojekt Theoretische Physik (FOKUS Mini Research Project Theoretical Physics): P (2 weekly contact hours), German or English, details on availability to be announced (approx. 3 weeks, part time)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

This module has the following assessment components
1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)
2. Seminar: talk (approx. 30 to 45 minutes)
3. Research project: project report (approx. 8 pages)

Assessment components 1 through 3 will be offered in German or English.
Students must register for assessment components 1 through 3 online (details to be announced).
Details on when assessment components 1 through 3 will be offered to be announced.
To pass this module, students must pass each of the assessment components 1 through 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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Subdivided Module Catalogue for the Subject
FOKUS Physics
Master’s with 1 major, 120 ECTS credits

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Contents

Specific and advanced knowledge of independent scientific work in a current research area, especially in the discipline of Astronomy, reproduction of knowledge, acquisition of social and methodological competencies. Application of the acquired professional knowledge and methods to new scientific questions in a mini research project (e.g. experiments, case studies etc.).

Intended learning outcomes

The students have special and advanced knowledge of independent scientific work in a current research area, especially in the specialist field of Astronomy, and are able to reproduce the acquired knowledge, to apply the acquired methods, to summarise a sub-area of the current research area in an oral presentation and to successfully implement the acquired knowledge and methods in a mini research project.

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

- FOKUS Einführungsmodul Astronomie (FOKUS Introductory Module Astronomy): V (3 weekly contact hours) + Ü/P (2 weekly contact hours), details on availability to be announced
- FOKUS Kompaktseminar Astronomie (FOKUS Block Taught Seminar Astronomy): S (2 weekly contact hours), German or English, details on availability to be announced (block taught seminar (3 days), usually held during semester break)
- FOKUS Miniforschungsprojekt Astronomie (FOKUS Mini Research Project Astronomy): P (2 weekly contact hours), German or English, details on availability to be announced (approx. 3 weeks, part time)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

This module has the following assessment components

1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)
2. Seminar: talk (approx. 30 to 45 minutes)
3. Research project: project report (approx. 8 pages)

Assessment components 1 through 3 will be offered in German or English.

Students must register for assessment components 1 through 3 online (details to be announced).

Details on when assessment components 1 through 3 will be offered to be announced.

To pass this module, students must pass each of the assessment components 1 through 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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Module title | Abbreviation
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FOKUS Research Module Type VMK14D Didactics | 11-FM-VMK14D-072-m01

Module coordinator | Module offered by
chairperson of examination committee | Faculty of Physics and Astronomy

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

Contents
Specific and advanced knowledge of independent scientific work in a current research area, especially in the discipline of Didactics, reproduction of knowledge, acquisition of social and methodological competencies. Application of the acquired professional knowledge and methods to new scientific questions in a mini research project (e.g. experiments, case studies etc.).

Intended learning outcomes
The students have special and advanced knowledge of independent scientific work in a current research area, especially in the specialist field of Didactics, and are able to reproduce the acquired knowledge, to apply the acquired methods, to summarise a sub-area of the current research area in an oral presentation and to successfully implement the acquired knowledge and methods in a mini research project.

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

- **FOKUS Einführungsmodul Didaktik** (FOKUS Introductory Module Didactics): V (3 weekly contact hours) + Ü/P (2 weekly contact hours), details on availability to be announced
- **FOKUS Kompaktseminar Didaktik** (FOKUS Block Taught Seminar Didactics): S (2 weekly contact hours), German or English, details on availability to be announced (block taught seminar (3 days), usually held during semester break)
- **FOKUS Miniforschungsprojekt Didaktik** (FOKUS Mini Research Project Didactics): P (2 weekly contact hours), German or English, details on availability to be announced (approx. 3 weeks, part time)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

This module has the following assessment components

1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)
2. Seminar: talk (approx. 30 to 45 minutes)
3. Research project: project report (approx. 8 pages)

Assessment components 1 through 3 will be offered in German or English.

Students must register for assessment components 1 through 3 online (details to be announced).
Details on when assessment components 1 through 3 will be offered to be announced.
To pass this module, students must pass each of the assessment components 1 through 3.

Allocation of places
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Additional information
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## Contents
Specific and advanced knowledge of independent scientific work in a current research area, especially in the discipline of Experimental Physics, reproduction of knowledge, acquisition of social and methodological competencies. Application of the acquired professional knowledge and methods to new scientific questions in a mini research project (e.g. experiments, case studies etc.).

## Intended learning outcomes
The students have special and advanced knowledge of independent scientific work in a current research area, especially in the specialist field of Experimental Physics, and are able to reproduce the acquired knowledge, to apply the acquired methods, to summarise a sub-area of the current research area in an oral presentation and to successfully implement the acquired knowledge and methods in a mini research project.

## Courses
**FOKUS Einführungsmodul Experimentelle Physik (FOKUS Introductory Module Experimental Physics):** V (3 weekly contact hours) + Ü/P (2 weekly contact hours), details on availability to be announced

**FOKUS Kompaktseminar Experimentelle Physik (FOKUS Block Taught Seminar Experimental Physics):** S (2 weekly contact hours), German or English, details on availability to be announced (block taught seminar (3 days), usually held during semester break)

**FOKUS Miniforschungsprojekt Experimentelle Physik (FOKUS Mini Research Project Experimental Physics):** P (2 weekly contact hours), German or English, details on availability to be announced (approx. 3 weeks, part time)

## Method of assessment
This module has the following assessment components

1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)
2. Seminar: talk (approx. 30 to 45 minutes)
3. Research project: project report (approx. 8 pages)

Assessment components 1 through 3 will be offered in German or English.

Students must register for assessment components 1 through 3 online (details to be announced).

Details on when assessment components 1 through 3 will be offered to be announced.

To pass this module, students must pass each of the assessment components 1 through 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)
### Module title

**FOKUS Research Module Type VMK14I Interdisciplinary Research Fields**

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### Module coordinator

chairperson of examination committee

### ECTS

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### Duration

1 semester

### Module level

graduate

### Other prerequisites

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### Contents

Specific and advanced knowledge of independent scientific work in a current research area, especially in interdisciplinary subjects, reproduction of knowledge, acquisition of social and methodological competencies. Application of the acquired professional knowledge and methods to new scientific questions in a mini research project (e.g. experiments, case studies etc.).

### Intended learning outcomes

The students have special and advanced knowledge of independent scientific work in a current research area, especially in interdisciplinary specialist fields, and are able to reproduce the acquired knowledge, to apply the acquired methods, to summarise a sub-area of the current research area in an oral presentation and to successfully implement the acquired knowledge and methods in a mini research project.

### Courses

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### Method of assessment

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

This module has the following assessment components

1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)
2. Seminar: talk (approx. 30 to 45 minutes)
3. Research project: project report (approx. 8 pages)

Assessment components 1 through 3 will be offered in German or English.

Students must register for assessment components 1 through 3 online (details to be announced).

Details on when assessment components 1 through 3 will be offered to be announced.

To pass this module, students must pass each of the assessment components 1 through 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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Module title

FOKUS Research Module Type VKM14T Theoretical Physics

Abbreviation

11-FM-VMK14T-072-m01

Module coordinator

chairperson of examination committee

Module offered by

Faculty of Physics and Astronomy

ECTS

Method of grading

Only after succ. compl. of module(s)

14 numerical grade

Duration

Module level

Other prerequisites

1 semester graduate --

Contents

Specific and advanced knowledge of independent scientific work in a current research area, especially in the discipline of Theoretical Physics, reproduction of knowledge, acquisition of social and methodological competencies. Application of the acquired professional knowledge and methods to new scientific questions in a mini research project (e.g. experiments, case studies etc.).

Intended learning outcomes

The students have special and advanced knowledge of independent scientific work in a current research area, especially in the special field of Theoretical Physics, and are able to reproduce the acquired knowledge, to apply the acquired methods, to summarise a sub-area of the current research area in an oral presentation and to successfully implement the acquired knowledge and methods in a mini research project.

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

- FOKUS Einführungsmodul Theoretische Physik (FOKUS Introductory Module Theoretical Physics): V (3 weekly contact hours) + Ü/P (2 weekly contact hours), details on availability to be announced
- FOKUS Kompaktseminar Theoretische Physik (FOKUS Block Taught Seminar Theoretical Physics): S (2 weekly contact hours), German or English, details on availability to be announced (block taught seminar (3 days), usually held during semester break)
- FOKUS Miniforschungsprojekt Theoretische Physik (FOKUS Mini Research Project Theoretical Physics): P (2 weekly contact hours), German or English, details on availability to be announced (approx. 3 weeks, part time)

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

This module has the following assessment components

1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)
2. Seminar: talk (approx. 30 to 45 minutes)
3. Research project: project report (approx. 8 pages)

Assessment components 1 through 3 will be offered in German or English.

Students must register for assessment components 1 through 3 online (details to be announced).

Details on when assessment components 1 through 3 will be offered to be announced.

To pass this module, students must pass each of the assessment components 1 through 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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**Contents**

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**Intended learning outcomes**

The students have special and advanced knowledge of independent scientific work in a current research area, especially in the specialist field of Astronomy, and are able to reproduce the acquired knowledge, to apply the acquired methods, to summarise a sub-area of the current research area in an oral presentation and to successfully implement the acquired knowledge and methods in a mini research project.

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

- FOKUS Einführungsmodul Astronomie (FOKUS Introductory Module Astronomy): V (4 weekly contact hours) + Ü/P (2 weekly contact hours), details on availability to be announced
- FOKUS Kompaktseminar Astronomie (FOKUS Block Taught Seminar Astronomy): S (2 weekly contact hours), German or English, details on availability to be announced (block taught seminar (3 days), usually held during semester break)
- FOKUS Miniforschungsprojekt Astronomie (FOKUS Mini Research Project Astronomy): P (2 weekly contact hours), German or English, details on availability to be announced (approx. 3 weeks, part time)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

This module has the following assessment components

1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)
2. Seminar: talk (approx. 30 to 45 minutes)
3. Research project: project report (approx. 8 pages)

Assessment components 1 through 3 will be offered in German or English. Students must register for assessment components 1 through 3 online (details to be announced). Details on when assessment components 1 through 3 will be offered to be announced.

To pass this module, students must pass each of the assessment components 1 through 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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### Module title

**FOKUS Research Module Type VMK16D Didactics**

**Abbreviation:** 11-FM-VMK16D-072-m01

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Specific and advanced knowledge of independent scientific work in a current research area, especially in the discipline of Didactics, reproduction of knowledge, acquisition of social and methodological competencies. Application of the acquired professional knowledge and methods to new scientific questions in a mini research project (e.g. experiments, case studies etc.).

### Intended learning outcomes

The students have special and advanced knowledge of independent scientific work in a current research area, especially in the specialist field of Didactics, and are able to reproduce the acquired knowledge, to apply the acquired methods, to summarise a sub-area of the current research area in an oral presentation and to successfully implement the acquired knowledge and methods in a mini research project.

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

- **FOKUS Einführungsmodul Didaktik** (FOKUS Introductory Module Didactics): V (4 weekly contact hours) + Ü/P (2 weekly contact hours), details on availability to be announced
- **FOKUS Kompaktseminar Didaktik** (FOKUS Block Taught Seminar Didactics): S (2 weekly contact hours), German or English, details on availability to be announced (block taught seminar (3 days), usually held during semester break)
- **FOKUS Miniforschungsprojekt Didaktik** (FOKUS Mini Research Project Didactics): P (2 weekly contact hours), German or English, details on availability to be announced (approx. 3 weeks, part time)

### Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

This module has the following assessment components

1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)
2. Seminar: talk (approx. 30 to 45 minutes)
3. Research project: project report (approx. 8 pages)

Assessment components 1 through 3 will be offered in German or English.

Students must register for assessment components 1 through 3 online (details to be announced).

Details on when assessment components 1 through 3 will be offered to be announced.

To pass this module, students must pass each of the assessment components 1 through 3.

### Allocation of places

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### Additional information

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**Intended learning outcomes**

The students have special and advanced knowledge of independent scientific work in a current research area, especially in the specialist field of Experimental Physics, and are able to reproduce the acquired knowledge, to apply the acquired methods, to summarise a sub-area of the current research area in an oral presentation and to successfully implement the acquired knowledge and methods in a mini research project.

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

- **FOKUS Einführungsmodul Experimentelle Physik (FOKUS Introductory Module Experimental Physics):** V (4 weekly contact hours) + Ü/P (2 weekly contact hours), details on availability to be announced
- **FOKUS Kompaktseminar Experimentelle Physik (FOKUS Block Taught Seminar Experimental Physics):** S (2 weekly contact hours), German or English, details on availability to be announced (block taught seminar (3 days), usually held during semester break)
- **FOKUS Miniforschungsprojekt Experimentelle Physik (FOKUS Mini Research Project Experimental Physics):** P (2 weekly contact hours), German or English, details on availability to be announced (approx. 3 weeks, part time)

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

This module has the following assessment components

1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)
2. Seminar: talk (approx. 30 to 45 minutes)
3. Research project: project report (approx. 8 pages)

Assessment components 1 through 3 will be offered in German or English.

Students must register for assessment components 1 through 3 online (details to be announced).

Details on when assessment components 1 through 3 will be offered to be announced.

To pass this module, students must pass each of the assessment components 1 through 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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FOKUS Research Module Type VMK16I Interdisciplinary Research Fields | 11-FM-VMK16I-072-m01

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<td>1 semester</td>
<td>graduate</td>
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</tbody>
</table>

**Contents**

Specific and advanced knowledge of independent scientific work in a current research area, especially in interdisciplinary subjects, reproduction of knowledge, acquisition of social and methodological competencies. Application of the acquired professional knowledge and methods to new scientific questions in a mini research project (e.g. experiments, case studies etc.).

**Intended learning outcomes**

The students have special and advanced knowledge of independent scientific work in a current research area, especially in interdisciplinary specialist fields, and are able to reproduce the acquired knowledge, to apply the acquired methods, to summarise a sub-area of the current research area in an oral presentation and to successfully implement the acquired knowledge and methods in a mini research project.

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

- **FOKUS Einführungsmodul Interdisziplinäre Fachgebiete (FOKUS Introductory Module Interdisciplinary Research Fields):** V (4 weekly contact hours) + Ü/P (2 weekly contact hours), details on availability to be announced.
- **FOKUS Kompaktseminar Interdisziplinäre Fachgebiete (FOKUS Block Taught Seminar Interdisciplinary Research Fields):** S (2 weekly contact hours), German or English, details on availability to be announced (block taught seminar (3 days), usually held during semester break).
- **FOKUS Miniforschungsprojekt Interdisziplinäre Fachgebiete (FOKUS Mini Research Project Interdisciplinary Research Fields):** P (2 weekly contact hours), German or English, details on availability to be announced (approx. 3 weeks, part time).

**Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)**

This module has the following assessment components:

1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages).
2. Seminar: talk (approx. 30 to 45 minutes).
3. Research project: project report (approx. 8 pages).

Assessment components 1 through 3 will be offered in German or English. Students must register for assessment components 1 through 3 online (details to be announced). Details on when assessment components 1 through 3 will be offered to be announced. To pass this module, students must pass each of the assessment components 1 through 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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Module title

FOKUS Research Module Type VMK16T Theoretical Physics

Abbreviation

11-FM-VMK16T-072-m01

Module coordinator

chairperson of examination committee

Module offered by

Faculty of Physics and Astronomy

ECTS

16

Method of grading

numerical grade

Only after succ. compl. of module(s)

Duration

1 semester

Module level

graduate

Other prerequisites

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Contents

Specific and advanced knowledge of independent scientific work in a current research area, especially in the discipline of Theoretical Physics, reproduction of knowledge, acquisition of social and methodological competencies. Application of the acquired professional knowledge and methods to new scientific questions in a mini research project (e.g. experiments, case studies etc.).

Intended learning outcomes

The students have special and advanced knowledge of independent scientific work in a current research area, especially in the specialist field of Theoretical Physics, and are able to reproduce the acquired knowledge, to apply the acquired methods, to summarise a sub-area of the current research area in an oral presentation and to successfully implement the acquired knowledge and methods in a mini research project.

Courses

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

FOKUS Einführungsmodul Theoretische Physik (FOKUS Introductory Module Theoretical Physics): V (4 weekly contact hours) + Ü/P (2 weekly contact hours), details on availability to be announced

FOKUS Kompaktseminar Theoretische Physik (FOKUS Block Taught Seminar Theoretical Physics): S (2 weekly contact hours), German or English, details on availability to be announced (block taught seminar (3 days), usually held during semester break)

FOKUS Miniforschungsprojekt Theoretische Physik (FOKUS Mini Research Project Theoretical Physics): P (2 weekly contact hours), German or English, details on availability to be announced (approx. 3 weeks, part time)

Method of assessment

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

This module has the following assessment components

1. Topics covered in lectures and exercises: written examination (approx. 90 minutes) or talk (approx. 30 minutes) or oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or project report (approx. 8 pages)
2. Seminar: talk (approx. 30 to 45 minutes)
3. Research project: project report (approx. 8 pages)

Assessment components 1 through 3 will be offered in German or English. Students must register for assessment components 1 through 3 online (details to be announced). Details on when assessment components 1 through 3 will be offered to be announced. To pass this module, students must pass each of the assessment components 1 through 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)

--
Module title
FOKUS Project Practical Course Physics

Abbreviation
11-FPP-072-m01

Module coordinator
chairperson of examination committee

Module offered by
Faculty of Physics and Astronomy

ECTS
10

Method of grading
numerical grade

Duration
1 semester

Module level
graduate

Other prerequisites
--

Contents
Independent work on a current research topic of Experimental and Theoretical Physics and implementation of scientific experiments including analysis and documentation of the results.

Intended learning outcomes
The students are able to independently work on a current research area of Experimental or Theoretical Physics, to conduct and analyse scientific experiments and to document the results.

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 can be chosen to earn a bonus)
placegment report / fieldwork report / report on practical training / report on practical course / project report / report on technical course (approx. 20 pages) and talk (approx. 30 minutes) on respective topic researched

Language of assessment: German or English

Allocation of places
--

Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
--
Module title: Advanced Practical Course Master

Abbreviation: 11-PFM-072-m01

Module coordinator: Managing Director of the Institute of Applied Physics

Module offered by: Faculty of Physics and Astronomy

ECTS: 6
Method of grading: Only after succ. compl. of module(s)

Duration: 1 semester
Module level: graduate
Other prerequisites: 11-A3

Contents:
Principles of Nuclear, Atomic and Molecular Physics, experiments on cryogenic temperatures and correlated systems, properties of solids, surfaces and interfaces. Experiments on the following topics: X-rays - nuclear magnetic resonance (NMR) - quantum Hall effect - optical pumping and spectroscopy in the field of optics - Hall effect - superconductivity - laser - solid-state optics

Intended learning outcomes:
Knowledge of conducting experiments, analyzing and documenting experimental results, basic knowledge of issuing scientific publications, application of modern evaluation systems, working on a task based on publications and acquiring practical experimental methods.

Courses (type, number of weekly contact hours, language — if other than German):
Fortgeschrittenen-Praktikum Master (Advanced Practical Course Master) Part 1: P (3 weekly contact hours), German or English
Fortgeschrittenen-Praktikum Master (Advanced Practical Course Master) Part 2: P (3 weekly contact hours), German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus):
This module has the following assessment components
1. Lab course in part 1 (Fortgeschrittenen-Praktikum Master/Advanced Practical Course Master Part 1): a) Preparing the experiment will be considered successfully completed if an oral test (approx. 30 minutes) is passed prior to the experiment. b) Performing and evaluating the experiment will be considered successfully completed if a test is passed. Students must prepare an experiment log (approx. 8 pages).
2. Lab course in part 2 (Fortgeschrittenen-Praktikum Master/Advanced Practical Course Master Part 2): a) Preparing the experiment will be considered successfully completed if an oral test (approx. 30 minutes) is passed prior to the experiment. b) Performing and evaluating the experiment will be considered successfully completed if a test is passed. Students must prepare an experiment log (approx. 8 pages).

Language of assessment: German or English
Students must register for assessment components 1 and 2 online (details to be announced). Students will be offered one opportunity to retake element a) and/or element b) in the respective semester. To pass an assessment component, they must pass both elements (a and b) in the same semester. To pass this module, students must pass both assessment component 1 and assessment component 2.

Allocation of places:

Additional information:

Referred to in LPO I (examination regulations for teaching-degree programmes)
Module title: Principles of two- and threedimensional Röntgen imaging
Abbreviation: 11-ZDR-111-m01

Module coordinator: Managing Director of the Institute of Applied Physics
Module offered by: Faculty of Physics and Astronomy

ECTS: 6
Method of grading: numerical grade

Duration: 1 semester
Module level: graduate

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
Physics of X-ray generation (X-ray tubes, synchrotron). Physics of the interaction between X-rays and matter (photon absorption, scattering), physics of X-ray detection. Mathematics of reconstruction algorithms (filtered back projection, Fourier reconstruction, iterative methods). Image processing (image data pre-processing, feature extraction, visualisation,...). Applications of X-ray imaging in the industrial sector (component testing, material characterisation, metrology, biology, ...). Radiation protection and biological radiation effect (dose, ...).

Intended learning outcomes
The students know the principles of generating X-rays and of their interactions with matter. They know imaging techniques using X-rays and methods of image processing as well as application areas of these methods.

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

Method of assessment
a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 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
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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
Introduction to Electron Microscopy

### Abbreviation
11-IEM-111-m01

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

## Module offered by
Faculty of Physics and Astronomy

## ECTS
4

## Method of grading
numerical grade

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

## 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

## Intended learning outcomes
The students have basic knowledge of modern research methods of electron microscopy up to an atomic level. They know microscoping procedures that are used in practice in labs and the industry as well as electron-microscopic methods for chemical analysis. They are able to evaluate the efficiency of different research methods.

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

## Method of assessment
- a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 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.

Language of assessment: German, English

## Allocation of places
- --

## Additional information
- --

## Referred to in LPO I (examination regulations for teaching-degree programmes)
- --
Concepts of Theoretical Astroparticle Physics

Abbreviation: 11-ATT-111-m01

Managing Director of the Institute of Theoretical Physics and Astrophysics

Faculty of Physics and Astronomy

ECTS: 4

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

Numerical grade: --

Duration: 1 semester

Module level: graduate

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

Concepts of Theoretical Astro-Particle Physics, e.g. Dark matter, cosmic radiation, neutrinos, baryogenesis, cosmic accelerators, dark energy, inflation.

Intended learning outcomes

The students have basic knowledge of the concepts of Theoretical Astroparticle Physics. They are able to describe phenomena of Astroparticle Physics on the basis of methods of Theoretical Physics and to find solution approaches for problems.

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

V + R (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 can be chosen to earn a bonus)

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 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

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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

**Master Thesis FOKUS Physics**

### Abbreviation

11-MA-PF-072-m01

### Module coordinator

chairperson of examination committee

### Module offered by

Faculty of Physics and Astronomy

### ECTS

30

### Method of grading

numerical grade

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

--

### Duration

1 semester

### Module level

graduate

### Other prerequisites

Registration for assessment to be carried out electronically. Deadlines will be announced separately. Please consult with your supervisor.

### Contents

Mostly independent processing of an experimental or theoretical task in a current research area of Experimental or Theoretical Physics, especially according to known procedures and scientific aspects; writing of the thesis.

### Intended learning outcomes

The students are able to independently work on an experimental or theoretical task from a current research area of Theoretical Physics, especially in accordance with known methods and scientific aspects and to summarise their results in a final paper.

### Courses

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

no courses assigned

### Method of assessment

(type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

written thesis (approx. 40 pages)

### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

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<table>
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<tr>
<th>Module title</th>
<th>Abbreviation</th>
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<td>Scientific Methods and Project Management FOKUS Physics</td>
<td>11-MP-PF-072-m01</td>
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<th>Module offered by</th>
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<tbody>
<tr>
<td>chairperson of examination committee</td>
<td>Faculty of Physics and Astronomy</td>
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<th>Duration</th>
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<td>1 semester</td>
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</table>

### Contents

Introduction to the methods of scientific work, taking into account methods of project planning. Application to theoretical and experimental questions of Physics, writing of a scientific project plan for the planned Master's thesis.

### Intended learning outcomes

The students have knowledge of scientific methods and methodological work, including project planning methods of a current experimental and theoretical subdiscipline of Physics with special relevance to the intended topic of the Master's thesis. They are able to draft a project plan for the Master's thesis and to plan the required experimental or theoretical work. They are able to describe their projects in oral presentations.

### Courses

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

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<th>Type</th>
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<th>Information on whether module can be chosen to earn a bonus</th>
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<tr>
<td>talk with discussion (approx. 30 to 45 minutes)</td>
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### Allocation of places

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### Additional information

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

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Module title | Abbreviation
---|---
Methods in Surface Spectroscopy | 11-MSS-102-m01

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

ECTS | 4 |

| Module coordinator | Module offered by |
---|---
Managing Director of the Institute of Applied Physics | Faculty of Physics and Astronomy |

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

Boundary conditions of experiments: Ultra-high vacuum, surface sensibility, light-matter-interaction, principles of photoelectron spectroscopy (PES), one-particle image of PES, three step model, many-particle effects, line shape, satellites, Fermi liquid, quasiparticles, exemplary systems and spectra, measurements with synchrotron radiation, related experimental methods.

Intended learning outcomes

The students know the physical principles and experimental methods of surface spectroscopy. They are able to conduct, evaluate and interpret simple measurements.

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 can be chosen to earn a bonus)

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 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.

Language of assessment: German, English

Allocation of places

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Additional information

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

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<table>
<thead>
<tr>
<th>Module title</th>
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<td>Modern Astrophysics</td>
<td>11-MAS-111-m01</td>
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<tr>
<td>Managing Director of the Institute of Theoretical Physics and Astrophysics</td>
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<table>
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<tr>
<th>Duration</th>
<th>Module level</th>
<th>Other prerequisites</th>
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<td>1 semester</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>
</tr>
</tbody>
</table>

**Contents**

Introduction to a field of modern Astrophysics, e.g. extra-galactic jets.

**Intended learning outcomes**

The students know the current state of research on the modern topic of Astrophysics. They know the physical values and are to plan and conduct observations in this area. This includes the ability to conceptualise a specific observational project and e.g. to apply for observation time at large telescopes.

**Courses**

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

V + R (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 can be chosen to earn a bonus)

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 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.

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>
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<tr>
<td>Module Type 4A Special Training Astronomy</td>
<td>11-SF-4A-072-m01</td>
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**Module coordinator**
Managing Director of the Institute of Theoretical Physics and Astrophysics

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

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<th>ECTS</th>
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<tbody>
<tr>
<td>1 semester</td>
<td>graduate</td>
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</table>

**Contents**
Specific, advanced knowledge of one or more of the Faculty’s current research areas in the field of Astronomy.

**Intended learning outcomes**
The students have specific and advanced knowledge of one or more current research areas of the faculty in the field of Astronomy.

**Courses**
(type, number of weekly contact hours, language — if other than German)
V + R (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 can be chosen to earn a bonus)

a) written examination (approx. 90 minutes) or b) talk (approx. 30 minutes) or c) oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or d) project report (approx. 8 pages)

**Allocation of places**
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**Additional information**
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**Referred to in LPO I**
(examination regulations for teaching-degree programmes)
Module title | Abbreviation
--- | ---
Module Type 4D Special Training Didactics | 11-SF-4D-072-m01

| Module coordinator | Module offered by |
--- | ---
Managing Director of the Institute of Applied Physics | Faculty of Physics and Astronomy

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

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

Contents
Specific, advanced knowledge of one or more of the Faculty's current research areas in the field of Didactics.

Intended learning outcomes
The students have specific and advanced knowledge of one or more current research areas of the faculty in the field of Didactics.

Courses (type, number of weekly contact hours, language — if other than German)
V + R (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 can be chosen to earn a bonus)
a) written examination (approx. 90 minutes) or b) talk (approx. 30 minutes) or c) oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or d) project report (approx. 8 pages)

Allocation of places
--

Additional information
--

Referred to in LPO I (examination regulations for teaching-degree programmes)
--
Module title | Abbreviation
---|---
Module Type 4E Special Training Experimental Physics | 11-SF-4E-072-m01

Module coordinator | Module offered by
Managing Director of the Institute of Applied Physics | Faculty of Physics and Astronomy

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<tbody>
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<td>1 semester</td>
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Contents
Specific, advanced knowledge of one or more of the Faculty's current research areas in the field of Experimental Physics.

Intended learning outcomes
The students have specific and advanced knowledge of one or more current research areas of the faculty in the field of Experimental Physics.

Courses (type, number of weekly contact hours, language — if other than German)
V + R (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 can be chosen to earn a bonus)
a) written examination (approx. 90 minutes) or b) talk (approx. 30 minutes) or c) oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or d) project report (approx. 8 pages)

Allocation of places
--

Additional information
--

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

**Module Type 4I Special Training Interdisciplinary Research Fields**

### Abbreviation

11-SF-4I-072-m01

### Module coordinator

Managing Directors of the Institute of Applied Physics and the Institute of Theoretical Physics and Astrophysics

### Module offered by

Faculty of Physics and Astronomy

### ECTS

4

### Method of grading

Numerical grade

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

Only after completion of the module(s)

### Duration

1 semester

### Module level

Graduate

### Other prerequisites

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### Contents

Specific, advanced knowledge of one or more of the Faculty's current research areas.

### Intended learning outcomes

The students have specific and advanced knowledge of one or more current research areas of the faculty in an interdisciplinary field.

### Courses

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

**V + R** (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 can be chosen to earn a bonus)**

a) written examination (approx. 90 minutes) or b) talk (approx. 30 minutes) or c) oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or d) project report (approx. 8 pages)

### Allocation of places

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### Additional information

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### Referred to in LPO I

(examination regulations for teaching-degree programmes)

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**Contents**
Specific, advanced knowledge of one or more of the Faculty's current research areas in the field of Theoretical Physics.

**Intended learning outcomes**
The students have specific and advanced knowledge of one or more current research areas of the faculty in the field of Theoretical Physics.

**Courses** (type, number of weekly contact hours, language — if other than German)
V + R (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 can be chosen to earn a bonus)
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**Allocation of places**
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**Additional information**
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**Contents**

Specific, advanced knowledge of one or more of the Faculty's current research areas in the field of Astronomy.

**Intended learning outcomes**

The students have specific and advanced knowledge of one or more current research areas of the faculty in the field of Astronomy.

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

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**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

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**Allocation of places**

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**Additional information**

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Specific, advanced knowledge of one or more of the Faculty's current research areas in the field of Didactics.

**Intended learning outcomes**

The students have specific and advanced knowledge of one or more current research areas of the faculty in the field of Didactics.

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

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**Allocation of places**

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**Contents**

Specific, advanced knowledge of one or more of the Faculty's current research areas in the field of Experimental Physics.

**Intended learning outcomes**

The students have specific and advanced knowledge of one or more current research areas of the faculty in the field of Experimental Physics.

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

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Specific, advanced knowledge of one or more of the Faculty's current research areas.

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The students have specific and advanced knowledge of one or more current research areas of the faculty in an interdisciplinary field.

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

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

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

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**Contents**
Specific, advanced knowledge of one or more of the Faculty's current research areas in the field of Theoretical Physics.

**Intended learning outcomes**
The students have specific and advanced knowledge of one or more current research areas of the faculty in the field of Theoretical Physics.

**Courses** (type, number of weekly contact hours, language — if other than German)
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**Module coordinator**
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**Contents**
Specific, advanced knowledge of one or more of the Faculty's current research areas in the field of Astronomy.

**Intended learning outcomes**
The students have specific and advanced knowledge of one or more current research areas of the faculty in the field of Astronomy.

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

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**Allocation of places**
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**Contents**

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**Intended learning outcomes**

The students have specific and advanced knowledge of one or more current research areas of the faculty in the field of Didactics.

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

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**Allocation of places**

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**Additional information**

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**Contents**

Specific, advanced knowledge of one or more of the Faculty's current research areas in the field of Experimental Physics.

**Intended learning outcomes**

The students have specific and advanced knowledge of one or more current research areas of the faculty in the field of Experimental Physics.

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

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

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**Allocation of places**

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**Additional information**

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Specific, advanced knowledge of one or more of the Faculty's current research areas.

### Intended learning outcomes
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### Courses
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### Method of assessment
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### Allocation of places
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### Additional information
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### Referred to in LPO I
(examination regulations for teaching-degree programmes)
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## Module title

### Subdivided Module Catalogue for the Subject

**FOKUS Physics**

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

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### Module coordinator

Managing Director of the Institute of Theoretical Physics and Astrophysics

### Module offered by

Faculty of Physics and Astronomy

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### Duration

1 semester  

### Module level

graduate  

### Other prerequisites

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### Contents

Specific, advanced knowledge of one or more of the Faculty's current research areas in the field of Theoretical Physics.

### Intended learning outcomes

The students have specific and advanced knowledge of one or more current research areas of the faculty in the field of Theoretical Physics.

### Courses

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

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

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### Allocation of places

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### Additional information

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### Referred to in LPO I

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**Contents**

Specific, advanced knowledge of one or more of the Faculty's current research areas in the field of Astronomy.

**Intended learning outcomes**

The students have specific and advanced knowledge of one or more current research areas of the faculty in the field of Astronomy.

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

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**Allocation of places**

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**Additional information**

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Subdivided Module Catalogue for the Subject
FOKUS Physics
Master's with 1 major, 120 ECTS credits

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<td><strong>Module Type 8D Special Training Didactics</strong></td>
<td>11-SF-8D-072-m01</td>
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<td>Managing Director of the Institute of Applied Physics</td>
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**Contents**
Specific, advanced knowledge of one or more of the Faculty's current research areas in the field of Didactics.

**Intended learning outcomes**
The students have specific and advanced knowledge of one or more current research areas of the faculty in the field of Didactics.

**Courses** (type, number of weekly contact hours, language — if other than German)
V + R (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 can be chosen to earn a bonus)
a) written examination (approx. 90 minutes) or b) talk (approx. 30 minutes) or c) oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or d) project report (approx. 16 pages)

**Allocation of places**
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**Additional information**
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**Referred to in LPO I** (examination regulations for teaching-degree programmes)
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<table>
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<th>Module title</th>
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<td>Module Type 8E Special Training Experimental Physics</td>
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<td>1 semester</td>
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**Contents**

Specific, advanced knowledge of one or more of the Faculty's current research areas in the field of Experimental Physics.

**Intended learning outcomes**

The students have specific and advanced knowledge of one or more current research areas of the faculty in the field of Experimental Physics.

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

V + R (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 can be chosen to earn a bonus)

a) written examination (approx. 90 minutes) or b) talk (approx. 30 minutes) or c) oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or d) project report (approx. 16 pages)

**Allocation of places**

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**Additional information**

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

--
### Module title
Module Type 8I Special Training Interdisciplinary Research Fields

### Abbreviation
11-SF-8I-072-m01

### Module coordinator
Managing Directors of the Institute of Applied Physics and 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
Graduate

### Other prerequisites
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## Contents
Specific advanced knowledge of one or more of the Faculty's current research areas.

### Intended learning outcomes
The students have specific and advanced knowledge of one or more current research areas of the faculty in an interdisciplinary field.

### Courses
(type, number of weekly contact hours, language — if other than German)
V + R (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 can be chosen to earn a bonus)
a) written examination (approx. 90 minutes) or b) talk (approx. 30 minutes) or c) oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or d) project report (approx. 16 pages)

### Allocation of places
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### Additional information
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Contents

Specific, advanced knowledge of one or more of the Faculty's current research areas in the field of Theoretical Physics.

Intended learning outcomes

The students have specific and advanced knowledge of one or more current research areas of the faculty in the field of Theoretical Physics.

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

V + R (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 can be chosen to earn a bonus)

a) written examination (approx. 90 minutes) or b) talk (approx. 30 minutes) or c) oral examination of one candidate each or oral examination in groups (approx. 30 minutes) or d) project report (approx. 16 pages)

Allocation of places

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Additional information

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<td>Advanced Seminar Experimental/Theoretical Physics</td>
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**Contents**

Seminar on current issues of Theoretical or Experimental Physics.

**Intended learning outcomes**

The students have advanced knowledge of a current specialist field of Experimental or Theoretical Physics. They are able to extract knowledge from professional publications and to summarise this knowledge and present it to a professional audience.

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

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

**Method of assessment** (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)

talk with discussion (approx. 30 to 45 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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Module title | Quantum Loop Gravity
---|---
Abbreviation | 11-QSG-102-m01

Module coordinator | Managing Director of the Institute of Theoretical Physics and Astrophysics
Module offered by | Faculty of Physics and Astronomy

ECTS | 4
Method of grading | Only after succ. compl. of module(s)

Duration | 1 semester
Module level | graduate
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
Aside from string theory, quantum loop gravity (QLG) is one of the most important approaches to a quantum mechanical description of gravity. General relativity is formulated in Hamiltonian formalism and the elemental variables are identified with the corresponding Poisson brackets. These variables are quantised in the typical manner on discretised graphs, so-called spin networks. In doing so, e.g. a quantisation of elemental volumes appears. Therefore, QLG belongs to the speculative theories which paint a picture of the constitution of space and time.

Intended learning outcomes
The students know the principles of quantum loop gravity. They have acquired advanced knowledge of a selected topic and have proved their knowledge in a seminar presentation.

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

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module can be chosen to earn a bonus)
a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 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.
Language of assessment: German, English

Allocation of places
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Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
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Module title | Abbreviation
--- | ---
Renormalization Group Methods in Field Theory | 11-RMFT-102-m01

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

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

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**Contents**
Renormalisation group methods for non-linear partial differential equations, field theoretical contexts and non-analysed behaviour of cryogenic temperatures.

**Intended learning outcomes**
The students gain an overview of non-linearities in partial differential equations and their solution on the basis of the renormalisation group method.

**Courses**
(type, number of weekly contact hours, language — if other than German)
V + R (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 can be chosen to earn a bonus)

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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.
Language of assessment: German, English

**Allocation of places**
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**Additional information**
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**Referred to in LPO 1** (examination regulations for teaching-degree programmes)
--
Module title | Abbreviation
---|---
Special Theory of Relativity | 11-SRT-112-m01

Module coordinator | Module offered by
Managing Director of the Institute of Theoretical Physics and Astrophysics | Faculty of Physics and Astronomy

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

Duration | Module level | Other prerequisites
---|---|---
1 semester | graduate | 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
Mathematical principles; differential forms; special relativity; Minkowski space; Lorentz transformation, Hamiltonian equation of motion; relativistic free particle

Intended learning outcomes
The students are familiar with the physical concepts and mathematical principles of special relativity. They are familiar with modern mathematical formulation of special relativity. They are able to apply the acquired knowledge to problems of special relativity.

Courses (type, number of weekly contact hours, language — if other than German)
V + R (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 can be chosen to earn a bonus)
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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
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Additional information
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Referred to in LPO I (examination regulations for teaching-degree programmes)
--
Module title: Spintronics

Abbreviation: 11-SPI-102-m01

Module coordinator: Managing Director of the Institute of Applied Physics

Module offered by: Faculty of Physics and Astronomy

ECTS: 6

Method of grading: numerical grade

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

Duration: 1 semester

Module level: graduate

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

This lecture covers the basic principles of spin transport, with a particular emphasis on the phenomena of giant magnetoresistance and tunnel magnetoresistance. As a last point, we discuss new phenomena from the field of spin dynamics and current-induced spin phenomena.

Intended learning outcomes

The students know the basic principles of spin transport models and the applications of spin transport in information technology. They have gained an overview of current findings in this field (giant magnetoresistance, tunnel magnetoresistance).

Courses

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

V + R (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 can be chosen to earn a bonus)

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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.

Language of assessment: German, English

Allocation of places

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Additional information

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

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Module title | Abbreviation
---|---
Strong Interaction in Accelerator Experiments | 11-WWB-102-m01

Module coordinator | Module offered by
Managing Director of the Institute of Applied Physics | Faculty of Physics and Astronomy

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Contents

Intended learning outcomes
The students know the basic organisation of QCD processes. They are able to interpret results of accelerator experiments. They have knowledge of methods of data analysis, understand the underlying theories and are able to apply them.

Courses (type, number of weekly contact hours, language — if other than German)
V + R (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 can be chosen to earn a bonus)

- a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 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.
Language of assessment: German, English

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

### Abbreviation
11-SUS-092-m01

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

### Module offered by
Faculty of Physics and Astronomy

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### Contents


**Supersymmetry II:** Minimal supersymmetric standard model. Higgs sector. The spectrum of supersymmetric particles. Phenomenology of LEP, Tevatron and LHC, supersymmetric neutrino mass models. Violation of R-parity.

### Intended learning outcomes

The students have knowledge of the mathematical and physical principles of supersymmetry and supersymmetric models. They understand the theory's formalism and recognise its connections to other models as well as its importance for phenomenology of elementary particles.

### Courses (type, number of weekly contact hours, language — if other than German)
V + R (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 can be chosen to earn a bonus)

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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.

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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## Subdivided Module Catalogue for the Subject

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

<table>
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<th>Module title</th>
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<td>Theoretical Astrophysics</td>
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### Module coordinator
Managing Director of the Institute of Theoretical Physics and Astrophysics

### Module offered by
Faculty of Physics and Astronomy

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### Contents
Theoretical Astrophysics, models for the description of complex observation results, numeric simulations.

### Intended learning outcomes
The students have basic knowledge of the methods of Theoretical Astrophysics. They are able to design complex observations and to test the models with the help of simulations.

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

R + 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 can be chosen to earn a bonus)

written examination (approx. 120 minutes)

### Allocation of places

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### Additional information

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**Contents**

a) metal-insulators and topological insulators  
b) transport phenomena  
c) magnetic impurities in metals. Kondo effect and heavy fermions  
d) electron-phonon interaction  
e) one-dimensional conductors

**Intended learning outcomes**

The students have advanced knowledge of the theoretical description of solid-state phenomena. They know the mathematical or theoretical methods and are able to apply them to problems of solid-state theory and understand the connections to experimental results. The individual students have elaborated on an advanced topic of solid-state theory and have discussed this topic in a seminar presentation.

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

V + R (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 can be chosen to earn a bonus)

a) written examination (approx. 90 minutes) or b) oral examination of one candidate each or oral examination in groups (approx. 30 minutes per candidate, for modules with less than 4 ECTS credits approx. 20 minutes) or c) project report (approx. 8 to 10 pages, time to complete: 1 to 4 weeks) or d) presentation/seminar presentation (approx. 30 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.

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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