Mastermodule

phy611 - Theoretical Methods

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<tr>
<th>Module name</th>
<th>Theoretical Methods</th>
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<tbody>
<tr>
<td>Module code</td>
<td>phy611</td>
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<tr>
<td>ECTS credit points</td>
<td>6.0 KP</td>
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<tr>
<td>Workload</td>
<td>180 h</td>
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Used in degree programmes
- Master Engineering Physics > Mastermodule

Contact person
- module responsibility
  - Björn Poppe

Prerequisites

Skills to be acquired in this module
- Computational Fluid Dynamics (CFD I & II)
  - Deeper understanding of the fundamental equations of fluid dynamics.
  - Overview of numerical methods for the solution of the fundamental equations of fluid dynamics.
  - Confrontation with complex problems in fluid dynamics.
  - To become acquainted with different, widely used CFD models that are used to study complex problems in fluid dynamics.
  - Ability to apply these CFD models to certain defined problems and to critically evaluate the results of numerical models.

Computerorientierte Physik
- Extension and complement of qualification in theoretical physics through the acquisition of solid and deep knowledge of advanced concepts and methods in theoretical physics. Depending on the selected course the students acquire knowledge in the fields of basis numerical methods of theoretical physics, algorithms and data structures in scientific computing, code debugging. They obtain skills for a confident application of modern methods of theoretical physics such as diagram generation, Molecular Dynamics and Monte Carlo simulations and quantitative analysis of advanced problems of theoretical physics and in further development of the physical intuition. They enhance their competences to effectively deal with sophisticated problems of theoretical physics, to independently develop approaches to current issues of theoretical physics, and to comprehend common concepts and methods of theoretical physics and the natural sciences, in general.

Modelling and Simulation
- The students attending successful the course acquire an advanced understanding of the conceptual design of models in the field of engineering sciences. Special emphasis is on identifying the significant physical processes and the choice of the most efficient modelling type. The interaction of numerical simulations with field measurements and laboratory measurements including the theory of similarity will be discussed. To meet the needs of renewable energy, laser technology, environmental sciences and marine sciences the practical focus is on the modelling and simulation of fluid dynamics in small scales and close to structures.

Module contents
- Computational Fluid Dynamics (CFD I & II)
  - CFD I: The Navier-Stokes equations, filtering / averaging of Navier- Stokes equations, introduction to numerical methods, finite- differences, finite-volume methods, linear equation systems, NS-solvers, RANS, URANS, LES, DNS, turbulent flows, incompressible flows, compressible flows, efficiency and accuracy.
  - CFD II: Introduction to different CFD models, such as OpenFOAM and PALM. Application of these CFD models to defined problems from rotor aerodynamics and the atmospheric boundary layer.

Computerorientierte Physik
- Debugging
- Data structures
- Algorithms
- Random number generation
- Data analysis
- Percolation
- Monte Carlo simulation
- Finite size scaling
- Quantum Monte Carlo
- Molecular dynamics simulations
- Event-driven simulations
- Graphs and algorithms
- Genetic algorithms
optimization problems

Modelling and Simulation

- Understanding of advanced fluid dynamics including three-dimensional, transient and compressible processes
- Identifying the significant physical processes, defining the dimensionality and relevant scales in time and space
- Theory of similarity, range of dimensionless numbers
- Potential Theory
- Numerical Algorithms and possibilities of independent coding of simplest mathematical models
- Limitations of numerical models, risk of empirical approaches included in numerical models
- Introduction of a complete chain of Open-Source-CFD-Tools, considering preprocessing, processing and postprocessing tools
- Need and availability of appropriate measurement techniques for the steering, calibration and verification of models
- Contactless high-resolving measuring techniques in the fluid dynamics
- Limits of accuracy of different modelling and simulation concepts

Recommended reading

- Computational Fluid Dynamics (CFD I & II)
  J. Fröhlich, Large Eddy Simulationen turbulenter Strömungen, Teubner, Wiesbaden, 2006. (in German)

- Computerorientierte Physik

- Modelling and Simulation

Links

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<th>Languages of instruction</th>
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phy612 - Advanced Physics I

Module name                     Advanced Physics I
Module code                     phy612
ECTS credit points              6.0 KP
Workload                        180 h
Used in degree programmes       Master Engineering Physics > Mastermodule

Contact person                  module responsibility
                                  - Bert Struve
                                  - Björn Poppe

Prerequisites

Skills to be acquired in this module

Fluiddynamik
Fouriertechniken in der Physik
The students know the definition of the Fourier-Transformation (FT) and learn about explicit examples. They know the properties and theorems of the FT, are able to apply these and describe physical processes both in time and frequency domain. They gain deep insights about physical processes analyzing the frequency domain and are able to utilize Fourier techniques solving physical problems, e.g. finding solutions of the time dependent Schrödinger equation. In addition, they learn about examples of the current English physical literature.

Photonics
Starting from basics, the module yields advanced knowledge of the physics of lasers, of optical radiation with matter, optoelectronic principles and components as, e.g. laser beams, different laser types, light emitters, detectors, modulators. The students acquire skills in working with lasers and optoelectronic components.

Module contents

Fluiddynamics I
Base equations: Navier-Stokes equations, continuity equation, Bernoulli’s law; Vortex and energy equations laminar flow and analysis of stability exact solutions and applications

Fluiddynamics II
Reynolds’ turbulence Closure problems and approaches models of turbulence, principles of CFD, Cascade models – stochastic models

Fouriertechniken in der Physik

Photonics
Fundamentals of lasers (optical gain, optical resonator, laser beams), laser types, laser safety; electronic bandstructures in matter, semiconductor junctions, radiation laws, light emitting diodes, photodetectors, solar cells.

Recommended reading

Fluiddynamics
P.A. Davidson: turbulence Oxford 2004

Fouriertechniken in der Physik (WS, 5.04.4651)
Weitere spezielle Literatur wird in der Vorlesung bekannt gegeben.

Photonics
Saleh, Teich: Fundamentals of Photonics, John Wiley & Sons
Ebeling: Integrierte Optoelektronik, Springer Verlag
Original literature according indication during course
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<td>Master Engineering Physics &gt; Mastermodule</td>
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<td>Contact person</td>
<td>module responsibility</td>
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<tr>
<td>Prerequisites</td>
<td>Björn Poppe</td>
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Skills to be acquired in this module
- Theoretical Physics III: Quantum mechanics (M.Ed.):
  - The students obtain competencies to identify application situations of quantum mechanics and to solve standard problems as well as to be able to impart knowledge properly (i.a. at schools).

- General Relativity:
  - The students acquire basic knowledge in the field of general relativity as well as of aspects of astrophysics and cosmology. They obtain skills for a confident application of modern methods of theoretical physics. These include in particular differential geometric concepts and quantitative analysis of advanced problems of theoretical physics. They enhance their competences to effectively deal with sophisticated problems of theoretical physics, to independently develop approaches to current issues of theoretical physics, and to comprehend common concepts and methods of theoretical physics and the natural sciences, in general.

- Acoustics:
  - Thorough understanding of acoustics and ability to make quantitative descriptions of phenomena in physical acoustics such as mechanical oscillations, acoustical wave propagation, reflections at boundaries, room acoustical properties, diffraction, and electro acoustical systems. Understanding of important concepts such as acoustical impedance, Q-factor, resonances, near and far field, standing waves, room modes, etc..

Module contents
- Theoretical Physics III: Quantum mechanics (M.Ed.):
  - Basic concepts and structures of non-relativistic quantum mechanics ( superposition principle, wave function, operators, eigenvalue problem, probabilistic interpretation, Schrödinger equation, Hilbert space and current topics like quantal measurement without interaction, Bell's inequality, decoherence), interpretation problems and questions of impartation of quantum mechanics at schools or other places.

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<td>&amp;1149: tensors</td>
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<td>&amp;1149: covariant differentiation</td>
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<tr>
<td>&amp;1149: Riemann curvature tensor</td>
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<td>&amp;1149: Einstein's field equations</td>
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<td>&amp;1149: conserved quantities</td>
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<td>&amp;1149: Schwarzschild solution</td>
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<td>&amp;1149: black holes</td>
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<td>&amp;1149: gravitational radiation</td>
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<tr>
<td>&amp;1149: Oscillations and waves</td>
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<tr>
<td>&amp;1149: Physical fundamentals of acoustics</td>
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<tr>
<td>&amp;1149: Generation and propagation of sound</td>
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<tr>
<td>&amp;1149: Measurement and evaluation of sound</td>
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<td>&amp;1149: Processing and analysis of acoustic signals</td>
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<td>&amp;1149: Acoustics of voice and speech</td>
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<td>&amp;1149: Speech pathology</td>
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<td>&amp;1149: Acoustic insulation and attenuation</td>
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<td>&amp;1149: Room and building acoustics</td>
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<td>&amp;1149: Electro acoustics</td>
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<td>&amp;1149: Shock waves</td>
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<td>&amp;1149: Photonoacoustic effect</td>
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<td>&amp;1149: Selected topics of acoustics, vibrations and ultrasonic</td>
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Recommended reading
- Theoretische Physik III: Quantenmechanik (M.Ed.)
  - C. Cohen-Tannoudji, et al.: Quantenmechanik, de Gruyter;
  - W. Nolting: Grundkurs Theoretische Physik, 5 Quantenmechanik, Springer Verlag;
  - J. Pade: Quantenmechanik zu Fuß, Springer (auch englisch: Quantum Mechanics for Pedestrians 1 & 2, Springer);
  - J. Audretsch: Verschränkte Welt, Wiley;
F. Selleri: Die Debatte um die Quantentheorie, Vieweg Verlag.

Allgemeine Relativitätstheorie
J. B. Hartle: Gravity: an introduction to Einstein’s general relativity. Addison-Wesley, San Francisco (CA), 2003

Akustik
Kollmeier, B.: Skriptum Physikalische, technische und medizinische Akustik, Universitaet Oldenburg
Heckl, Müller: Taschenbuch der technischen Akustik, Springer Verlag
F.G. Kollmann: Maschinenakustik, Springer Verlag

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<tr>
<td>Languages of instruction</td>
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<td>Duration (semesters)</td>
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<td>Module frequency</td>
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<td>Final exam of module</td>
<td>1 written exam oder 1 presentation oder 1 oral exam oder 1 seminar paper</td>
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phy631 - Advanced Metrology

Module name: Advanced Metrology
Module code: phy631
ECTS credit points: 6.0 KP
Workload: 180 h

Used in degree programmes:
- Master Engineering Physics > Mastermodule

Contact person:
- module responsibility
  - Walter Neu
  - Björn Poppe
  - Simon Doclo
  - Martin Kühn

Prerequisites:
Skills to be acquired in this module:
The course in Advanced Metrology sets up a high level route enabling the students to acquire skills to allow them to operate effectively in the majors of Engineering Physics. This is achieved by provision of state-of-the-art technical and physical approaches covering broad aspects of advanced metrology within the context of Laser&Optics, Biomedical physics & acoustics, and renewable energies. Demonstrate systematic knowledge across appropriate advanced metrology technologies, management and environmental issues to provide solutions for international industries and/or research organisations.

Module contents:
The module combines theory and practical applications of the fundamentals of metrology in all majors.
- Fundamentals of Metrology
- Dimensional Measurement Systems
- Basic metrology operators including Association and Filtration.
- Optical Metrology and Instrumentation
- Surface and Nanometrology
- Machine Tool and Large Volume Metrology
- Process Measurement and Control
- Individual Project

Recommended reading:
Recent publications on specific topics

Links:
Language of instruction: English
Duration (semesters): 1 semester
Module frequency: halbjährlich
Module capacity: unlimited
Modulelevel: MM (Mastermodul)
Modulart: Pflicht
Lern-/Lehrform / Type of program:
- Lecture: 4 hrs/week

Vorkenntnisse / Previous knowledge:

Examination:

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Course type:

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<td></td>
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<td>4</td>
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| Exercises | 2 | WinSem | 28 h |

Total attendance time of module: 84 h
phy640 - Seminar Advanced Topics in EP

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<td></td>
<td>Walter Neu</td>
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<td></td>
<td>Sandra Koch</td>
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<td>Prerequisites</td>
<td>Participation: 1st -3rd semester. Presentation: Master thesis work in progress or finished; at least one successfully completed specialization module.</td>
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<td>Skills to be acquired in this module</td>
<td>The students are enabled to demonstrate the ability to communicate clearly, both orally and in writing, to specialist and non-specialist audiences. Demonstrate knowledge, fundamental understanding and critical awareness of current research fields in the student’s master projects. Personal development through practice of communication, presentation, time management, teamwork, problem solving, project management, critical evaluation, numeracy, and IT skills.</td>
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<td>max 1h oral presentation and written report or oral exam (1 hour and regular active and documented participation in the seminar spread over the first three semesters.)</td>
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**phy653 - Engineering Sciences I**

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<td>Simon Doclo</td>
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### Examination

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### Contact person
- module responsibility
  - Ulrich Teubner
  - Martin Kühn
  - Simon Doclo

### Prerequisites
- acc. selected course

### Skills to be acquired in this module
- acc. selected course

### Module contents
- acc. selected course

### Recommended reading
- acc. selected course

### Languages of instruction
- German, English

### Duration (semesters)
- 1 semester

### Module frequency
- halbjährlich

### Module capacity
- unlimited

### Modulelevel
- MM-PB (Professionalisierungsbereichsmodul im Master)

### Modulart
- Wahlpflicht

### Examination
- examination periods
- Type of examination
  - acc. selected course

### Final exam of module
- acc. selected course
## phy655 - Engineering Sciences III

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<td><strong>Modulart</strong></td>
<td>Wahlpflicht</td>
</tr>
<tr>
<td><strong>Vorkenntnisse / Previous knowledge</strong></td>
<td>acc. selected course</td>
</tr>
<tr>
<td><strong>Examination</strong></td>
<td>examination periods</td>
</tr>
<tr>
<td><strong>Final exam of module</strong></td>
<td>acc. selected course</td>
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</table>
### phy662 - Specialization III

<table>
<thead>
<tr>
<th><strong>Module name</strong></th>
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<tr>
<td><strong>Module code</strong></td>
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<tr>
<td><strong>ECTS credit points</strong></td>
<td>6.0 KP</td>
</tr>
<tr>
<td><strong>Workload</strong></td>
<td>180 h</td>
</tr>
<tr>
<td><strong>Used in degree programmes</strong></td>
<td>Master Engineering Physics &gt; Mastermodule</td>
</tr>
<tr>
<td><strong>Contact person</strong></td>
<td>module responsibility</td>
</tr>
<tr>
<td></td>
<td>BetreuerIn der Masterarbeit</td>
</tr>
</tbody>
</table>

#### Prerequisites
- Kennten lernen des aktuellen Forschungsstandes im Spezialgebet und Erwerb fachlicher Spezialkenntnisse.

#### Module contents
- Einarbeitung und wissenschaftliche Anleitung zum selbständigen Arbeiten im speziellen Fachgebiet, in dem die Masterarbeit geschrieben werden soll.

#### Recommended reading
- Wird entsprechend dem konkreten Thema spezifiziert.

#### Links
- **Languages of instruction**: German, English
- **Duration (semesters)**: 1 semester
- **Module frequency**: halbjährlich
- **Module capacity**: unlimited
- **Modullevel**: MM-PB (Professionalisierungsbereichsmodul im Master)
- **Modulart**: Wahlpflicht

#### Examination

<table>
<thead>
<tr>
<th>Examination</th>
<th>examination periods</th>
<th>Type of examination</th>
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<tbody>
<tr>
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<td></td>
<td>Werden entsprechend dem konkreten Thema spezifiziert.</td>
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</table>

<table>
<thead>
<tr>
<th>Course type</th>
<th>Comment</th>
<th>SWS</th>
<th>Offer rhythm</th>
<th>Workload attendance</th>
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</thead>
<tbody>
<tr>
<td>Lecture</td>
<td></td>
<td>4</td>
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<td>56 h</td>
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<td>Exercises</td>
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<td>2</td>
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<td>28 h</td>
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<td>Seminar</td>
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**Total attendance time of module**: 84 h
phy663 - Specialization I

Module name
Specialization I

Module code
phy663

ECTS credit points
6.0 KP

Workload
180 h

Used in degree programmes
- Master Engineering Physics > Mastermodule

Contact person
module responsibility
- Hans Josef Brückner
- Martin Kühn
- Simon Doclo

Prerequisites
Acc. selected course

Skills to be acquired in this module
The acquisition of knowledge and the strategy for understanding the subject topics is achieved through taught lectures, supervised laboratory sessions, tutorials, seminars, practical demonstrations and personal study presentations on coursework assignments. This module enables the students to emphasize on a field of specialisation in Engineering Physics at the cutting edge of research.

Module contents
The course is intended to be integrative, a culmination of knowledge, skills, competencies and experiences acquired in other modules, coupled with further development of these assets. Acc. selected course

Recommended reading
Acc. selected course

Links
http://www.uni-oldenburg.de/ep/

Languages of instruction
German, English

Duration (semesters)
1 semester

Module frequency
halbjährlich

Module capacity
unlimited

Modulelevel
MM-PB (Professionalisierungsbereichsmodul im Master)

Modulart
Wahlpflicht

Lern-/Lehrform / Type of program
Please check the course descriptions for further information: http://www.uni-oldenburg.de/ep/

Vorkenntnisse / Previous knowledge

Examination
examination periods
Type of examination

Final exam of module
Assignments may consist of case studies, practical reports, or reviews of recent research Material is introduced through lectures, laboratories, and directed reading and research. Students are given guidance on how to manage their learning, and at each stage in their development they are expected to take responsibility for their own learning. Acc. selected course

Course type
Comment
SWS
Offer rhythm
Workload attendance

Seminar
Specialization Laser & Optics
4
SumSem and WinSem
56 h

Seminar
Specialization Renewable Energies
4
SumSem and WinSem
56 h

Seminar
Acoustics
4
SumSem and WinSem
56 h

Seminar
**Biomedical Physics**
4
SumSem and WinSem
56 h

Total attendance time of module
224 h
**phy664 - Specialization II**

**Module name**  
Specialization II

**Module code**  
phy664

**ECTS credit points**  
6.0 KP

**Workload**  
180 h

**Used in degree programmes**  
- Master Engineering Physics > Mastermodule

**Contact person**  
module responsibility
- Martin Kühn
- Hans Josef Brückner
- Simon Doclo

**Prerequisites**  
Acc. selected course

**Skills to be acquired in this module**  
The acquisition of knowledge and the strategy for understanding the subject topics is achieved through taught lectures, supervised laboratory sessions, tutorials, seminars, practical demonstrations and personal study presentations on coursework assignments. This module enables the students to emphasize on a field of specialisation in Engineering Physics at the cutting edge of research.

**Module contents**  
The course is intended to be integrative, a culmination of knowledge, skills, competencies and experiences acquired in other modules, coupled with further development of these assets.

**Recommended reading**  
Acc. selected course

**Languages of instruction**  
German, English

**Duration (semesters)**  
1 semester

**Module frequency**  
halbjährlich

**Module capacity**  
unlimited

**Modullevel**  
MM-PB (Professionalisierungsbereichsmodul im Master)

**Modulart**  
Wahlpflicht

**Lern-/Lehrform / Type of program**  
Acc. selected course

**Vorkenntnisse / Previous knowledge**

**Examination**  

<table>
<thead>
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<th>examination periods</th>
<th>Type of examination</th>
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</thead>
<tbody>
<tr>
<td>Final exam of module</td>
<td></td>
<td>Assignments may consist of case studies, practical reports, or reviews of recent research Material is introduced through lectures, laboratories, and directed reading and research. Students are given guidance on how to manage their learning, and at each stage in their development they are expected to take responsibility for their own learning. Acc. selected course</td>
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</table>

Acc. selected course
Module name: Specialization IV
Module code: phy665
ECTS credit points: 6.0 KP
Workload: 180 h

Used in degree programmes: Master Engineering Physics > Mastermodule

Contact person: module responsibility
- Hans Josef Brückner
- Martin Kühn
- Simon Doclo

Prerequisites: Acc. selected course

Skills to be acquired in this module: The acquisition of knowledge and the strategy for understanding the subject topics is achieved through taught lectures, supervised laboratory sessions, tutorials, seminars, practical demonstrations and personal study presentations on coursework assignments. This module enables the students to emphasize on a field of specialisation in Engineering Physics at the cutting edge of research.

Module contents: The course is intended to be integrative, a culmination of knowledge, skills, competencies and experiences acquired in other modules, coupled with further development of these assets.

Recommended reading: Acc. selected course

Languages of instruction: German, English
Duration (semesters): 1 semester
Module frequency: halbjährlich
Module capacity: unlimited
Modullevel: MM-PB (Professionalisierungsbereichsmodul im Master)
Modulart: Wahlpflicht

Lern-/Lehrform / Type of program: Acc. selected course

Vorkenntnisse / Previous knowledge

Examination: examination periods
Type of examination: Final exam of module
Assignments may consist of case studies, practical reports, or reviews of recent research Material is introduced through lectures, laboratories, and directed reading and research. Students are given guidance on how to manage their learning, and at each stage in their development they are expected to take responsibility for their own learning.

Acc. selected course
**phy681 - Tools and Skills for Scientific Engineering**

<table>
<thead>
<tr>
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<th>Tools and Skills for Scientific Engineering</th>
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<tbody>
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<td>Used in degree programmes</td>
<td>Master Engineering Physics &gt; Mastermodule</td>
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<tr>
<td>Contact person</td>
<td>module responsibility</td>
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<tr>
<td></td>
<td>Simon Doclo</td>
</tr>
<tr>
<td></td>
<td>Walter Neu</td>
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<td>Prerequisites</td>
<td>Acc. selected course</td>
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<tr>
<td>Skills to be acquired in this module</td>
<td>This module aims to raise the students understanding of the strategic, leadership, and technical aspects of project management and their role in adding competitive advantage to any enterprise. Concepts and techniques for programme and project management are introduced, developed and applied, with the aid of relevant case material. The students learn to consider specific key instrument types in current usage. This will be delivered in a project study format with each instrument being evaluated in terms of operating principle, design, and signal processing.</td>
</tr>
<tr>
<td>Module contents</td>
<td>Acc. selected course</td>
</tr>
<tr>
<td>Recommended reading</td>
<td>Acc. selected course</td>
</tr>
<tr>
<td>Links</td>
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<td>Languages of instruction</td>
<td>German, English</td>
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<td>Duration (semesters)</td>
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<tr>
<td>Module frequency</td>
<td>halbjährlich</td>
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<tr>
<td>Module capacity</td>
<td>unlimited</td>
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<td>Modullevel</td>
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<td>Examination</td>
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## phy692 - Research Project EWEM

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<td>• Master Engineering Physics &gt; Mastermodule</td>
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<td>Prerequisites</td>
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<td>Skills to be acquired in this module</td>
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<tr>
<td>Module contents</td>
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<td>Links</td>
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<td>Languages of instruction</td>
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<td>Duration (semesters)</td>
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<td>Module frequency</td>
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<tr>
<td>Module capacity</td>
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<td>Modullevel</td>
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<td>Modulart</td>
<td>je nach Studiengang Pflicht oder Wahlpflicht</td>
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<tr>
<td>Lern-/Lehrform / Type of program</td>
<td></td>
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<tr>
<td>Vorkenntnisse / Previous knowledge</td>
<td></td>
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<tr>
<td>Examination</td>
<td>examination periods</td>
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<td>Type of examination</td>
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Abschlussmodul

mam - Master’s Thesis Module

<table>
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<td>Used in degree programmes</td>
<td>Master Engineering Physics &gt; Abschlussmodul</td>
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<td>Contact person</td>
<td>module responsibility</td>
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<td></td>
<td>BetreuerIn der Masterarbeit</td>
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<tr>
<td>Prerequisites</td>
<td>Master Curriculum Engineering Physics</td>
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<tr>
<td>Skills to be acquired in this module</td>
<td>The learned requirements and methods are applied on a specific scientific problem and combined with acquired key skills such as team work, project management and presentations skills.</td>
</tr>
<tr>
<td>Module contents</td>
<td>The master thesis constitutes the final examination of the master study program. Within this context the students are dealing independently with a current topic of research from the fields of the working groups. The work is accompanied by a seminar for presentation and validation of the interim results and the progress of the work. The results will be defended in a final colloquium and generally shall be contributed to a scientific paper.</td>
</tr>
<tr>
<td>Recommended reading</td>
<td>as required</td>
</tr>
<tr>
<td>Languages of instruction</td>
<td>German, English</td>
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<tr>
<td>Duration (semesters)</td>
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<td>Modullevel</td>
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<td>Lern-/Lehrform / Type of program</td>
<td>seminar, lab, self study</td>
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<td>Vorkenntnisse / Previous knowledge</td>
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</tr>
<tr>
<td>Examination</td>
<td>examination periods</td>
</tr>
<tr>
<td>Final exam of module</td>
<td>Master thesis and colloquium</td>
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</table>
**Frühere Module**

**phy050 - Experimental Physics V: Solid State Physics**

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<tbody>
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<td>ECTS credit points</td>
<td>6.0 KP</td>
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<tr>
<td>Workload</td>
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| Used in degree programmes    | • Fach-Bachelor Engineering Physics > Aufbaumodule  
• Fach-Bachelor Physik > Aufbaumodule  
• Master Engineering Physics > Frühere Module |
| Contact person               | module responsibility                       |
|                             |     = Achim Kittel                          |
| Prerequisites                |                                             |
| Skills to be acquired in this module |                                             |
| Module contents              |                                             |
| Recommended reading          |                                             |
| Links                        |                                             |
| Language of instruction      | German                                     |
| Duration (semesters)         | 1 semester                                 |
| Module frequency             |                                             |
| Module capacity              | unlimited                                  |
| Modulelevel                  | ---                                        |
| Modularart                   | je nach Studiengang Pflicht oder Wahlpflicht |
| Lern-/Lehrform / Type of program |                                             |
| Vorkenntnisse / Previous knowledge |                                             |
| Examination                  | examination periods                        |
|                             | Type of examination                        |
| Final exam of module         | KL                                         |