phy612 - Advanced Physics I

Module label          Advanced Physics I
Module code           phy612
Credit points         6.0 KP
Workload              180 h
Used in course of study
• Master's Programme Engineering Physics > Pflichtmodule
Contact person

Entry requirements

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.

Reader’s advisory

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

Links
Languages of instruction: German, English
Duration (semesters): 1 Semester
Module frequency: jährlich
Module capacity: unlimited
Module level: MM (Mastermodul)
Modulart: Wahlpflicht
Lern-/Lehrform / Type of program: Lecture and exercise --> according selected course
Vorkenntnisse / Previous knowledge:

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<tr>
<th>Examination</th>
<th>Time of examination</th>
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<td>Final exam of module</td>
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<td>1 exam or 1 presentation or 1 oral examination or 1 chore</td>
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Course type: Seminar

SWS
Frequency
Workload attendance: 0 h