Technology
Arts Sciences
TH Köln

Course
PH2 - Physics 2

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General information

Long name	Physics 2
Approving CModule	PH2_BaET
Responsible	Prof. Dr. Christof Humpert Professor Fakultät IME
Level	Bachelor
Semester in the year	winter semester
Duration	Semester
Hours in self-study	60
ECTS	5
Professors	Prof. Dr. Christof Humpert Professor Fakultät IME
Requirements	Functions (sin, cos, exp, ln) Equations and systems of equations (linear, quadratic) Analysis (differential and integral calculus) Linear algebra (2-/3-dim vector calculation) Differential equations Complex numbers Basic physical terms Kinematics, dynamics Forces, Newton's axioms Work, energy, energy conservation Momentum, momentum conservation Torque, angular momentum
Language	German
Separate final exam	Yes

Final exam

Details

Written examination, oral examination only in individual cases, with the following elements:
- Multiple choice and assignment questions to query fundamental concepts, relationships and analogies
- Free-text answers to query further knowledge and the basic understanding of physical relationships
- Preparation of sketches to test further understanding
- Application-oriented text tasks, whose solutions make it necessary to analyze and reduce the physical problems, select a suitable model and apply it mathematically.

Minimum standard

50 % of the questions and tasks correctly solved

Exam Type

Written examination, oral examination only in individual cases, with the following elements:
- Multiple choice and assignment questions to query fundamental concepts, relationships and analogies
- Free-text answers to query further knowledge and the basic understanding of physical relationships

- Preparation of sketches to test further understanding
- Application-oriented text tasks, whose solutions make it necessary to analyze and reduce the physical problems, select a suitable model and apply it mathematically.

Lecture / Exercises

Learning goals

Knowledge

Mechanics
- Oscillations of mass-spring systems (free/forced, undamped/damped)
- Resonance behavior, quality factor, resonance curve
- Analogy of mechanical and electrical oscillation systems
- Superposition of oscillations (beat)
- Waves, wave propagation (longitudinal, transversal)
- Superposition of waves (interference), standing waves
- Mechanics of fluids and gases (Bernoulli)

Optics
- Huygens Fresnel Principle
- Reflection, total reflection, refraction, diffraction
- Doppler effect (classic)
- Geometric optics

Thermodynamics
- Kinetic gas theory, ideal gases
- thermal expansion, absolute temperature
- Fundamentall laws of thermodynamics
- Thermodynamic processes (isothermal, isobaric, isochoric, adiabatic)

Skills

Recognize and apply analogies, e.g. mechanical / electrical oscillations
Derive and apply equations of motion from balances of forces or energies
Describe and explain wave propagation processes
Derive superposition of harmonic waves and calculate standing waves
Apply Bernoulli equation and determine state variables of the fluid
Derive thermomechanical state variables (pressure, volume, temperature) from the fundamental laws
Analyze physical problems, apply physical models and calculate with them

Expenditure classroom teaching

Type	Attendance (h/Wk.)

Lecture	2
Exercises (whole course)	2
Exercises (shared course)	0
Tutorial (voluntary)	0

Separate exam

none

Practical training

Learning goals

Knowledge

Error analysis
- Systematic and random measurement deviations
- Absolute and relative measurement deviations
- Graphical determination of the measurement deviations
- Calculated determination of the measurement deviations
- Error statistics (distribution, mean, standard deviation)
- Error propagation

Demonstration experiment
- Mathematical pendulum

Lab exercises
- Fall acceleration
- Spring constant, spring pendulum
- Damped torsional oscillation

Online lab exercises
- Forced torsional oscillation

Skills

Analyze, modify and verify experimental setup
Record measurement data and create a simple log
Perform an error calculation and evaluate the measurement deviation
Evaluate, assess and compare measured data with expectation or known values
Create a structured report

Expenditure classroom teaching

Type	Attendance (h/Wk.)
Practical training	1
Tutorial (voluntary)	0

Separate exam

Exam Type

working on projects assignment with your team e.g. in a lab)

Details

Online entrance test to control student preparation

Evaluation of the test report

Minimum standard

70% of online tests correct

80% of the measurement results correct

80% of the evaluation performed correctly

Discussion of evaluation available