Technology
Arts Sciences
TH Köln

Course Manual PH2

Physics 2

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General information

Long name	Physics 2
Approving CModule	PH2_BaET
Responsible	Prof. Dr. Uwe Oberheide Professor Fakultät IME
Valid from	winter semester 2021/22
Level	Bachelor
Semester in the year	winter semester
Duration	Semester
Hours in self-study	60
ECTS	5
Professors	Prof. Dr. Uwe Oberheide Professor Fakultät IME

Literature

Tippler, Mosca; Physik (Springer Spektrum)

Giancoli; Physik Lehr- und Übungsbuch (Pearson)

Halliday, Resnick, Walker; Halliday Physik (Wiley-VCH)

Final exam

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

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	EN Klausur

− Lecture / Exercises

Learning goals

Goal type	Description
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)

Special requirements

none

Accompanying material	Presentation slides for the lecture Collection of exercise tasks with solutions Questionnaire to prepare the exam Links to Internet resources with basic information
Separate exam	No

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

− Practical training

Learning goals

Goal type	Description
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

Special requirements

none

Accompanying material	Documents to introduce the lab excerices incl. script for error calculation Background information and task description of lab excerices Questionnaire to prepare the lab excerices
Separate exam	Yes

Separate exam

Exam Type	EN Projektaufgabe im Team bearbeiten (z.B. im Praktikum)
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