Module title	Abbreviation
Theoretical Mechanics and Quantum Mechanics - Excercices	11-T-TMQ-162-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)
6	(not) successfully completed	--

Duration	Module level	Other prerequisites
2 semester	undergraduate	--

Contents

Exercises in theoretical mechanics and quantum mechanics in accordance with the contents of the corresponding lecture. Among others: inertial systems, Newton's laws of motion, equations of motion; Dimensional motion, energy conservation; harmonic oscillator; movement in space of intuition, conservative forces, Lagrangian formulation, variational principles, Euler-Lagrange equation; constraints; coordinate transformations, mechanical gauge transformation; symmetries, Noether theorem, cyclic coordinates; accelerated reference systems and apparent powers, Legendre transformation, phase space; Hamilton function, canonical equations; Poisson brackets, canonical transformations; generator of symmetries, conservation laws; minimal coupling; Liouville theorem; Hamilton-Jacobi formulation [optional], central force problems; mechanical similarity, Virial theorem; minor vibrations; particles in an electromagnetic field; rigid bodies, torque and inertia tensor, centrifugal and Euler equations [optional]; scattering, cross section [optional], relativistic dynamics, Lorentz transformation; Minkowski space; equations of motion, non-linear dynamics, stability theory; KAM theory [optional]; deterministic chaos [optional], wave function and Schrödinger equation (SG), formalisation of QM, eigenvalue equations, postulates of QM, dimensional problems, spin-1/2 systems, angular momentum, central potential, hydrogen atom, moving in the electromagnetic field, addition of angular momenta, approximation methods, atoms with several electrons, etc.

Intended learning outcomes

The students have gained first experiences concerning the working methods of Theoretical Physics. They are familiar with the principles of theoretical mechanics, their different formulations and the mathematical methods of quantum mechanics. They are able to independently apply the acquired mathematical methods and techniques to simple problems of Theoretical Physics, to interpret the results and to apply them to the description and solution of problems of quantum theory. They have especially acquired knowledge of basic mathematical concepts and are able to interpret the results in a physical manner.

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

Ü (2) + Ü (2)
Module taught in: German or English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

Students must complete approx. 13 exercise sheets per semester.
To pass the assessment, students must successfully complete approx. 50% of these exercises. The lecturer will inform students about the respective details at the beginning of the semester.
Language of assessment: German and/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 appears in

Bachelor' degree (1 major) Mathematical Physics (2016)

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