Valid from 2024.HS

Module description: Physics 3: Kinematics and Kinetics

Module Code	t.BA.MTP.PHY3.19HS
ECTS Credits	4
Language of Instruction/Examination	German
Organizational Unit	IMES
Module Coordinator	Robert Eberlein
Legal Framework	The module description is part of the legal basis in addition to the general academic regulations. It is binding. During the first week of the semester a written and communicated supplement can specify the module description in more detail.
Module Characteristic	Type 2a 4 consecutive lecture lessons per semester week and class
Module Description	The prime objective of this module is the transfer of engineering knowledge on engineering dynamics. Special emphasis is placed on the transfer of theoretical know-how to engineering applications.

Module description: Physics 3: Kinematics and Kinetics

Module Content	**Motion of a point mass: Kinematics** • Repetition of rectilinear motion • Basic tasks in point mass kinematics • Three-dimensional motion • Fixed cartsian coordinates • Cylindric coordinates • Frenet-Serret frame • Exercises **Motion of a point mass: Kinetics** • 2. Newtonian principle in 3D coordinate systems • Repetition free motion • Repetition constrained motion • Resistance forces • Repetition work-energy theorem, conservation of energy • Exercises **Motion of a point mass: Non-inertial reference frames** • Translation as relative motion • Velocities in a rotating system • Accelerations in a rotating system • Forces in a rotating system • Exercices **Dynamics of systems of point masses** • Fundamentals • Principle of linear momentum • Principle of angular momentum • Exercises **Dynamics of rigid bodies** • Rotation about a fixed axis • Mass moment of inertia • Principle of angular momentum • Kinetics in plane motion (center of gravity versus fixed point in space) • Work-energy theorem, conservation of energy • Aspects of kinematics, instantaneous center of rotation • Exercises **Kinetics of rigid bodies in three-dimensional motion** • Principles of linear and angular momentum • Inertia tensor and Eularian equations • Support reaction in plane motion • Exercises
Prerequisite Knowledge	Physics 1, analysis 1 & 2, algebra und statistics 1 & 2, statics

Module description: Physics 3: Kinematics and Kinetics

Learning Objectives (Competences)

Students...	Competencies	Taxonomies
Knowledge of fundamentals in kinematics and kinetics of point masses	F	K3
Knowledge of fundamentals in point mass and rigid body systems	F	K3
Modeling and analyzing of point masses with non-inertial reference frames	F, M	K3, K4
Analytical solutions for point mass systems in engineering applications	M, F	K3, K4
Analytical solutions for rigid body sysmtems in engineering applications	M, F	K3, K4
Numerical simulation of 2D and 3D rigid body systems	M	K2

Performance Assessment

End-of-module exam	Assessment	Length (min.)	Weighting	Form
written exam	Grade	90	80	acc. to module agreement

Performance assessment during the semester	Assessment	Length (min.)	Weighting	Form
written exam	Grade	45	20	acc. to module agreement

Classroom Attendance Requirement

None

Learning material

Comments

Deviations from the proof of performance during the lesson can be made if the lecturer announces this in writing in a module agreement during the first week of the study semester.