

Mechanics, second course

Mekanik, fördjupningskurs
4 credits

Programme course

TMME69

Valid from: 2025 Spring semester

Determined by	Main field of study	
Board of Studies for Electrical Engineering, Physics and Mathematics	Applied Physics	
Date determined	Course level	Progressive specialisation
2024-08-28	First cycle	G2X
Revised by	Disciplinary domain	
	Technology	
Revision date	Subject group	
	Mechanical Engineering	
Offered first time	Offered for the last time	
Spring semester 2025		
Department	Replaced by	
Institutionen för ekonomisk och industriell utveckling		

Course offered for

- Master of Science in Applied Physics and Electrical Engineering - International
- Master of Science in Applied Physics and Electrical Engineering

Prerequisites

A basic mechanics course, such as Mechanics and fundamental physical concepts, calculus including differential equations, vector and matrix algebra.

Intended learning outcomes

To develop a broader and deeper knowledge of classical mechanics through the study of particle mechanics relative to rotating/accelerating reference frames, rigid body dynamics and analytical mechanics. After the course, the student should be able to:

- Formulate equations of motion relative to accelerating and rotating frames of reference.
- With a systematic approach solve rigid body dynamics problems in three dimensions.
- Apply the methods of analytical mechanics formulate equations of motion in generalized coordinates implicitly containing constraints.
- Formulate, implement and document a computer simulation of a mechanics problem formulated as a system of nonlinear differential equations.

Course content

Angular velocity and acceleration as vectors. The Coriolis equation. Dynamics of particles in rotating and accelerating coordinate systems. The equations of motion for rigid bodies.

Calculation of the moment of momentum for a rigid body. The inertia tensor and its representation in different coordinate systems. Formulation and numerical solution of mechanics problems as systems of ordinary differential equations.

Teaching and working methods

The course is given as a series of lectures and computer sessions. More emphasis than typical for a course at this level is given to computer sessions where the students implement mechanical models in MATLAB.

Examination

UPG1	Computer assignments	0.5 credits	U, G
TEN1	Written examination	3.5 credits	U, 3, 4, 5

Grades for examination modules are decided in accordance with the assessment criteria presented at the start of the course.

Grades

Four-grade scale, LiU, U, 3, 4, 5

Other information

Supplementary courses: Analytical mechanics, courses in Physics, applied mechanics, mechatronics, automatic control and vehicle dynamics.

About teaching and examination language

The teaching language is presented in the Overview tab for each course. The examination language relates to the teaching language as follows:

- If teaching language is “Swedish”, the course as a whole could be given in Swedish, or partly in English. Examination language is Swedish, but parts of the examination can be in English.
- If teaching language is “English”, the course as a whole is taught in English. Examination language is English.
- If teaching language is “Swedish/English”, the course as a whole will be taught in English if students without prior knowledge of the Swedish language participate. Examination language is Swedish or English depending on teaching language.

Other

The course is conducted in such a way that there are equal opportunities with regard to sex, transgender identity or expression, ethnicity, religion or other belief, disability, sexual orientation and age.

The planning and implementation of a course should correspond to the course syllabus. The course evaluation should therefore be conducted with the course syllabus as a starting point.

The course is campus-based at the location specified for the course, unless otherwise stated under “Teaching and working methods”. Please note, in a campus-based course occasional remote sessions could be included.