Engineering Mechanics - Dynamics

Programme course

6 credits

Mekanik - dynamik

TMME28

Valid from: 2017 Spring semester

Determined by
Board of Studies for Mechanical
Engineering and Design

Date determined
2017-01-25

Main field of study

Mechanical Engineering

Course level

First cycle

Advancement level

G1X

Course offered for

- Mechanical Engineering, M Sc in Engineering

Entry requirements

Note: Admission requirements for non-programme students usually also include admission requirements for the programme and threshold requirements for progression within the programme, or corresponding.

Prerequisites

Basic courses in linear algebra and calculus, Mechanics - Statics

Intended learning outcomes

The goal of the course is to give the student familarity with the basic laws of dynamics and the skill to apply them independently to actual problems. After the course, the student should be able to:

- Define the basic concepts in mechanical engineering as force, couple, equilibrium, velocity, acceleration, angular velocity, angular acceleration, linear impulse and linear momentum, angular impulse and angular momentum, mechanical work, energy and gyroscopic motion.
- Apply the above concepts and definitions to problems related to engineering mechanics.
- Perform simple derivations of theorems and expressions used in dynamics of particles and dynamics of rigid bodies.
- Draw free body diagrams, formulate kinematic constraints and derive the governing equations for mechanical problems by using Euler laws of motion for rigid bodies.

Course content

Newtons laws of motion. Gravity. Kinematics of particles (velocity and acceleration in cartesian and polar coordinates). Linear and angular momentum for a particle. Impuls and impact. Mechanical work, kinetic and potential energy. Kinematics of rigid bodies (velocity and acceleration, instantaneous center of zero velocity). Coriolis equation. Plane kinetics of rigid bodies (Eulers equations of motion, mass moment of inertia, linear and angular momentum, work, energy, impulse). Three dimensional kinematics of rigid bodies (the angular velocity vector, velocity, acceleration). Three dimensional motion of rigid bodies (Eulers equations of motion, the inertia matrix, rotation about a fixed axis, gyroscopic motion).

Teaching and working methods

The lectures treats topics of principal importance, and might, apart from theory and examples, also contain clarifying experiments. The purpose of the lessons is to give the student an ability to solve problems independently.

Examination

TEN1	Written examination	6 credits	U, 3, 4, 5

Grades

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

Other information

Supplementary courses: Mechanics, second course, Vibration analysis of structures, Solid mechanics

Department

Institutionen för ekonomisk och industriell utveckling

Director of Studies or equivalent

Peter Schmidt

Examiner

Stefan Lindström

Course website and other links

Education components

Preliminary scheduled hours: 56 h
Recommended self-study hours: 104 h

Course literature

Additional literature

Books

Meriam, J.L., Kraige, L.G, *Engineering Mechanics* Vol 1 & 2

Common rules

Regulations (apply to LiU in its entirety)

The university is a government agency whose operations are regulated by legislation and ordinances, which include the Higher Education Act and the Higher Education Ordinance. In addition to legislation and ordinances, operations are subject to several policy documents. The Linköping University rule book collects currently valid decisions of a regulatory nature taken by the university board, the vice-chancellor and faculty/department boards.

LiU's rule book for education at first-cycle and second-cycle levels is available at http://styrdokument.liu.se/Regelsamling/Innehall/Utbildning_pa_grund-_och_avancerad_niva.