Engineering Mechanics

Programme course

10 credits

Mekanik I

TMME27

Valid from: 2017 Spring semester

Determined by
Board of Studies for Industrial Engineering and Logistics

Date determined
2017-01-25

Main field of study
Mechanical Engineering

Course level
First cycle

Advancement level
G1X

Course offered for
- Industrial Engineering and Management, M Sc in Engineering
- Industrial Engineering and Management - International, 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
Algebra, Calculus.

Intended learning outcomes

The purpose of the course is to give the students an understanding knowledge of the basic laws of classical mechanics, and ability to independently apply the laws on concrete mechanical problems. After the course the student should:

- Know the definitions of the fundamental concepts used in mechanics as presented in the course, such as force, couple, equilibrium, mass center, velocity, acceleration, linear momentum, angular momentum, mass moment of inertia, linear impulse, angular impulse, power, work and energy.
- Be able to define and compute the quantities above in situations in engineering mechanics.
- Be able to compute the forces and couples on a mechanical system in equilibrium.
- Be able to apply the Free-Body Diagram technique, formulate kinematic relations, formulate the Newton and Euler's laws of motion for practical problems of the character treated during the course.
- Be able to prove simpler results that resemble those presented in the course.
- Be able to apply the laws treated in the course in order to explain, in qualitative terms, the outcome of mechanical experiments.
- Be able to judge whether a calculated result is reasonable.

Course content

- Part 1. Statistics: two- and three-dimensional force systems, couples, reduction of force systems, static equilibrium, center of gravity, Coulomb's law of friction, belt friction. Dynamics of a particle: Newton's laws of motion, velocity and acceleration in rectangular and curvilinear coordinates, work--energy and impulse--momentum principles, impact, vibrations.
- Part 2. Rigid body dynamics: kinematics (method of relative velocity and acceleration, instant center of velocity), absolute and relative derivatives of vectors, kinetics (Euler's law of motion, work--energy and impulse--momentum principles) and applications (impact, gyroscopic motion, dynamically unbalanced bodies). A computer assignment (formulation and numerical solution of the governing equations of a mechanical system).

Teaching and working methods

The course is given as lectures and classes.
The course runs over the entire autumn semester.

Examination

TEN2	Written examination	5 credits	U, 3, 4, 5
TEN1	Written examination	5 credits	U, 3, 4, 5

An examination is held after each subcourse to assess the student's knowledge. The examinations are designed in a problem solving format, with a maximum score of 15 points. 6 points are passing.

Grades

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

Other information

Supplementary courses:
Solid mechanics, Mechanical heat transfer and fluid mechanics, Machine elements, Automatic control, Multibody dynamics and robotics.

Department

Institutionen för ekonomisk och industriell utveckling

Director of Studies or equivalent

Peter Schmidt

Examiner

Peter Schmidt, Ulf Edlund

Education components

Preliminary scheduled hours: 94 h
Recommended self-study hours: 173 h

Course literature

Additional literature

Books

Meriam, James Lathrop, Kraige, L. Glenn, (2013) *Engineering mechanics : SI version*
ISBN: 9781118083451
Hoboken, N.J. : John Wiley & Sons, cop. 2013

Compendia

Christensen, P, Kompendium i stelkroppsmekanik

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.