



LUNDS UNIVERSITET
Lunds Tekniska Högskola

Course syllabus

Flerkroppsdynamik Multibody Dynamics

FMEN02, 7,5 credits, A (Second Cycle)

Valid for: 2023/24

Faculty: Faculty of Engineering, LTH

Decided by: PLED M

Date of Decision: 2023-04-11

General Information

Elective for: BME4, F4, F4-bem, M4-bem, Pi4-bem

Language of instruction: The course will be given in English

Aim

- provide knowledge of the basic theory of the dynamics of multibody systems consisting of rigid bodies as well as simple flexible bodies.
- give insight in the numerical analysis of the equations of multibody dynamics.

Learning outcomes

Knowledge and understanding

For a passing grade the student must

- be able to give an account of the most important results in the theory of multibody dynamics.
- be able to formulate theoretical models for systems of connected rigid bodies and simple elastic bodies.
- have knowledge of the commercial computer programmes that are available.

Competences and skills

For a passing grade the student must

- be able to analyse certain simple multibody systems with the aid of computer programmes (Mathcad, FEM, MBS-programmes).
- be able to perform an analysis of a multi-body system and to present the results in a well-written report.
- be able to describe some technical problems in industrial applications that can be

studied with multibody dynamics.

Judgement and approach

For a passing grade the student must

- be able to evaluate achieved results based on the problem formulation at hand as well as physical limitations.

Contents

Rigid body kinematics and dynamics; Euler angles, etc, inertia tensor, Euler equations, Energy and Effect. Fixed-axis rotation; reaction forces, dynamic balancing, stability, Gyroscopic movement. d'Alembert's principle. Lagrange's equations; constraints, degrees of freedom, Lagrange function, generalized forces. Multibody systems; holonomic and non-holonomic constraints, contact forces, friction, loss of effect. Lagrange's equations with constraints. Rigid and flexible bodies in systems; discretization and coordinate representation mass- and stiffness-matrices. Equations of motion, construction and numerical treatment. Computer programmes; ADAMS, Matlab.

Examination details

Grading scale: TH - (U,3,4,5) - (Fail, Three, Four, Five)

Assessment: Hand in exercises and written exam.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Admission

Assumed prior knowledge: Basic courses in Mechanics, Linear Algebra and Calculus in One Variable and Several Variables.

The number of participants is limited to: No

The course overlaps following course/s: FMEN01, FME071, FME120

Reading list

- Lecture Notes.
- Lecture notes.

Contact and other information

Course coordinator: Prof. Aylin Ahadi, aylin.ahadi@mek.lth.se

Course homepage: <http://www.mek.lth.se>

Further information: The course might be offered in English.