Faculty of Health, Science and Technology
Mechanical Engineering

Syllabus

Dynamics with computer-aided analysis

Course Code:	MSAD18
Course Title:	Dynamics with computer-aided analysis
	Dynamik med datorstöd
Credits:	7.5
Degree Level:	Master's level
Progressive Specialisation:	Second cycle, has only first-cycle course/s as entry requirements (A1N)

Major Field of Study:
MTA (Mechanical Engineering)

Course Approval
The syllabus was approved by the Faculty of Health, Science and Technology 2019-03-13, and is valid from the Autumn semester 2019 at Karlstad University.

Prerequisites
Mechanics, 7.5 ECTS credits, Calculus in One Variable, 7.5 ECTS credits, Calculus in Several Variables, 7.5 ECTS credits, Linear Algebra and Vector Analysis, 7.5 ECTS credits, plus upper seconday level Swedish 3 or B or Swedish as a second language 3 or B, and English 6 or A, or equivalent

Learning Outcomes
Upon completion of the course, students should be able to
- model plane and three-dimensional dynamic problems using computer algebra systems based on laws, conditions, and definitions,
- apply Euler angles and rotation matrices in accelerating referential frames,
- calculate the moment of inertia tensor for simple three-dimensional bodies,
- apply Newton's laws and derive equations on the basis of simple three-dimensional shapes,

- give an account of and use the basic concepts of mechanics, such as force, force couple, work, energy, momentum, angular momentum, and moment of inertia, in three dimensions.

Content
Instruction is in the form of film recordings and exercises.

- Cartesian and spherical coordinates
- Moment of inertia tensor for single solid bodies and systems of solid bodies
- Analysis of absolute and relative movement and kinematic constraints
- Particle kinematics in three dimensions
- Rotation of solid bodies around a fixed point and general movement in two and three dimensions
- Work, energy, momentum, impulse, angular momentum, impulse momentum, conservation laws
- Applications, for instance analysis of mechanisms and the movement of bodies in relation to central impact

Students use computer aids to solve dynamic problems. When presenting the theory, it is taken into account that the analysis is computer-aided, and general universally applicable relationships and methods are therefore sought. There is a special emphasis on formulating relevant differential equations and their solutions for given initial values.

Reading List
See separate document.

Examination
Assessment is based on a written exam aided by a computer algebra system.

Grades
One of the grades Distinction (VG), Pass (G), or Fail (U) is awarded in the examination of the course. For Engineering students, one of the grades 5 (Pass with Distinction), 4 (Pass with Some Distinction), 3 (Pass), or U (Fail) is awarded in the examination of the course.

Quality Assurance
Follow-up relating to learning conditions and goal-fulfilment takes place both during and upon completion of the course in order to ensure continuous improvement. Course evaluation is partly based on student views and experiences obtained in accordance with current regulations and partly on other data and documentation. Students will be informed of the result of the evaluation and of any measures to be taken.

Course Certificate
A course certificate will be provided upon request.

Additional information
The local regulations for studies at the Bachelor and Master levels at Karlstad University stipulate the obligations and rights of students and staff.