Course Specifications
Valid as from the academic year 2019-2020

Kinematics and Dynamics of Mechanisms (E041011)

Due to Covid 19, the education and evaluation methods may vary from the information displayed in the schedules and course details. Any changes will be communicated on Ufora.

Course offerings and teaching methods in academic year 2019-2020

- A (semester 1) Dutch UGent on campus lecture: plenary exercises 30.0 h on campus lecture 30.0 h
- B (semester 1) on campus lecture: plenary exercises 15.0 h on campus lecture 15.0 h

Lecturers in academic year 2019-2020
Abdel Wahab, Magd TW08 lecturer-in-charge

Offered in the following programmes in 2019-2020

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<tr>
<th>Programme</th>
<th>Credits</th>
<th>Offering</th>
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<tr>
<td>Bachelor of Science in Engineering (main subject Electromechanical Engineering)</td>
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<td>Bachelor of Science in Electromechanical Engineering</td>
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<td>Bridging Programme Master of Science in Electromechanical Engineering</td>
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<td>Bridging Programme Master of Science in Electromechanical Engineering and Automation</td>
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<td>Preparatory Course Master of Science in Electrical Power Engineering</td>
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<td>Preparatory Course Master of Science in Maritime Engineering</td>
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<td>Preparatory Course Master of Science in Mechanical Construction</td>
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Teaching languages
Dutch

Keywords
kinematics, dynamics, mechanisms, equilibrium, machinery

Position of the course

Contents

**Kinematics** (translation and rotation):
- Kinematics of wheels and gears (Simple gear trains, Compound gear trains, Engine gearbox)
- Kinematics of linkages and mechanisms (Relative motion, Linkages, Fixed-frame mechanism, Three-bar linkage mechanism, Slider-crank mechanism, Four-bar mechanism)

(Approved)
linkage Mechanism)

**Kinetics** (force and acceleration, work and energy and impulse and momentum):*

- *Kinetics of wheels and gears* (Flywheel, Gears)
- *Kinetics of linkage and mechanisms* (Inertia forces, Rotation and translation of linkages, Linkage mechanism, Slider-crank mechanism)

**Balancing of Machines:***

- *Balancing of rotating masses* (Static balance, Dynamic balance)
- *Balancing of reciprocating engines* (Balancing of a single-cylinder engine, Balancing of a multi-cylinder engine)
- *Whirling of shafts* (Whirling speed of a shaft, Whirling speed of a mass, Dunkerely's formula, Flywheel)

**Special Applications to Machinery:**

- *Cams* (Type of follower motion, Disk cam with knife-edge follower, Disk cam with flat-faced follower, Disk cam with translating roller follower)
- *Gear teeth* (Spur gear, Helical gear, Worm gear, Planetary gear)

**Numerical Techniques:**

- *Multibody dynamics* (Newton-Euler, compound double pendulum, Numerical integration, Lagrange)
- *Finite Element modelling of mechanisms* (Finite Element Method, Kinematic analysis, Kinetic analysis)

*First year brugprogramma master in Engineering Sciences: Mechanical-Electrical Engineering

Initial competences

- Statics, kinematics and dynamics of rigid bodies

Final competences

1. To be familiar with the basic notions of velocity, acceleration, force and energy in mechanisms.
2. To be familiar with the basic notions of analyzing the motion of mechanisms.
3. To be familiar with several well known mechanisms.
4. To be able to apply kinematics and dynamics techniques to mechanisms.
5. To be familiar with velocities, accelerations, forces and energies in mechanisms.
6. Understanding and interpreting correctly the calculated quantities and their units.
7. To be able to use a commercial mechanism software SAM (Synthesis and Analysis of Mechanisms)

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

On campus lecture, on campus lecture: plenary exercises

Learning materials and price

VTK-cursusdienst: Magd Abdel Wahab, Kinematics and Dynamics of Mechanisms. (price €9.5 (member VTK) / €14 (non-member VTK))

References


Course content-related study coaching

Evaluation methods

- end-of-term evaluation and continuous assessment

Examination methods in case of periodic evaluation during the first examination period

- Written examination

Examination methods in case of periodic evaluation during the second examination period

- Written examination

Examination methods in case of permanent evaluation

- Report

Possibilities of retake in case of permanent evaluation

- examination during the second examination period is not possible

(Approved)
Extra information on the examination methods
   During examination period: written exam - theory and problems. During semester:
   projects + reports.
Calculation of the examination mark
   First examination period: course work 30% and final exam 70%. Second examination
   period: only final exam 70%.