

## Mechanics, Vibrations and Waves (I002417)

**Course size** *(nominal values; actual values may depend on programme)*

**Credits 5.0**

**Study time 150 h**

**Contact hrs**

50.0h

**Course offerings and teaching methods in academic year 2022-2023**

A (semester 1)

Dutch

Gent

lecture

32.5h

lecture: plenary exercises

17.5h

online lecture

0.0h

**Lecturers in academic year 2022-2023**

Poelman, Dirk

WE04

lecturer-in-charge

**Offered in the following programmes in 2022-2023**

**crdts**

**offering**

Bachelor of Science in Bioscience Engineering(main subject Agricultural Sciences)

5

A

Bachelor of Science in Bioscience Engineering(main subject Cell and Gene Biotechnology)

5

A

Bachelor of Science in Bioscience Engineering(main subject Chemistry and Food Technology)

5

A

Bachelor of Science in Bioscience Engineering(main subject Environmental Technology)

5

A

Bachelor of Science in Bioscience Engineering(main subject Forest and Nature Management)

5

A

Bachelor of Science in Bioscience Engineering(main subject Land, Water and Climate)

5

A

Bachelor of Science in Bio-Engineering (Joint Section)

5

A

**Teaching languages**

Dutch

**Keywords**

Mechanics, mechanical vibrations and waves, statics, dynamics

**Position of the course**

Give the students a thorough training in basic physics, oriented both on basic principles and on practical applications.

**Contents**

Basic principles: what is physics; units; orders of magnitude; differentiation of kinematics - statics - dynamics

Kinematics in one and more dimensions; axle systems; vector displacement, velocity and acceleration; relative movements; radial and tangential components of the acceleration

Dynamics: laws of Newton; normal forces; frictional forces; free body diagrams

Pseudo-forces: centrifugal and Coriolis force

General gravitation; laws of Kepler

Work, kinetic and potential energy; conservative and non-conservative forces; power

Impulse; impulse and energy conservation; collisions in one and more dimensions

Kinematics of rotational movements; angular displacement, angular velocity and acceleration

Dynamics of rotational movements: torque, moment of inertia, angular momentum

Statics: composition of forces and torques, balance of a rigid body, elasticity and fracture

Vibrations: harmonic vibrations, damping, forced vibrations, quality factor

Waves: transverse and longitudinal waves, standing waves, mathematical description of waves, intensity of waves, energy transport, Doppler effect

**Initial competences**

Final competences of secondary school or equivalent. Advise: required subjects in the curricula 'Mathematics' of the officially recognized educational networks in Flanders for programmes with at least 6 hours of mathematics training per week in the last two years of the secondary school program (general secondary education) are recommended.

**Final competences**

- 1 Have the ability to recognize and analyze forces in mechanical systems.
- 2 Have the ability to apply Newtons laws for translations and rotations.
- 3 Have the ability to describe and analyze mechanical vibrations.
- 4 Be able to solve statics and dynamics problems using concepts of force, impulse, angular momentum and energy.

**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**

Lecture: plenary exercises, Online lecture, Lecture

**Extra information on the teaching methods**

Plenary exercises: guided problem solving. The problems are made available in advance.

**Learning materials and price**

D.C. Giancoli, Physics for scientists and engineers, volume 1. Cost approx. € 80.  
The powerpoint presentations, used in theory lessons, are made available to the students in electronic form.

**References**

D.C. Giancoli, Physics for scientists and engineers, volume 1  
R.C. Hibbeler, Engineering mechanics - Statics

**Course content-related study coaching**

Opportunity to ask questions before and after the lectures and electronically (through email or the electronic learning platform), both to the teacher and the research assistants.

**Assessment moments**

end-of-term assessment

**Examination methods in case of periodic assessment during the first examination period**

Written examination with multiple choice questions, Written examination with open questions

**Examination methods in case of periodic assessment during the second examination period**

Written examination with multiple choice questions, Written examination with open questions

**Examination methods in case of permanent assessment****Possibilities of retake in case of permanent assessment**

examination during the second examination period is not possible

**Extra information on the examination methods**

The multiple choice part of the exam is graded with standard setting.

**Calculation of the examination mark**

Written exam: 40% of the marks on the multiple choice part, 60% on the open questions (theory and problem solving).