

IDENTIFICATION

Course code : E2CP4B8
ECTS : 3

DURATION

Lectures : 16
Tutorial classes : 16
Labs : 8
Total : 40

Project :
Personnal work :

ASSESSMENT

2 Written exams (2h/2h) + 1 Lab report

TEACHING MATERIALS

LANGUAGE

English

CONTACT

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UE : BATIMENT-ENERGIE

COURSE : Solid Mechanics

SCOPE OF THE COURSE

OBJECTIVES

This course enables students to study the motion of a rigid body.

1. **Kinematics of rigid bodies** : rigid body in mechanics, velocity and acceleration fields, Varignon's theorem, change of reference frame (inertial and accelerated frames).
2. **Elements of kinetics** : mass of a material system, center of inertia of a rigid body, moments of inertia, kinetic energy.
3. **Dynamic study of material systems** : modeling of mechanical actions, laws of dynamics in a Galilean reference frame.
4. **Energy study of material systems.**

COMPETENCE AND SKILLS

- Know and apply Newton's laws to rigid bodies in motion.
- Understand basic concepts : position, velocity, acceleration, force, moment, and kinetic energy.
- Analyze the motion of points and rigid bodies in translation and rotation, and apply motion equations.
- Master motion descriptions (trajectories, velocities, accelerations) in fixed and moving frames.
- Understand and use concepts of moment of inertia and torque.
- Calculate the work done by forces and torques on rigid bodies.
- Apply energy and momentum conservation principles (impulse and angular momentum).
- Apply solid dynamics principles to real-world engineering problems (vehicle mechanics, rotating machines, moving structures, etc.).

PROGRAM

1. Kinematics of points and rigid bodies : trajectories, velocities, accelerations, fixed and moving frames.
2. Newton's laws applied to rigid bodies : forces, moments, motion equations.
3. Kinetics of rigid bodies : mass, center of inertia, moment of inertia, kinetic energy.
4. Work of forces and torques, mechanical power, energy balances.
5. Conservation of energy, linear momentum, and angular momentum.
6. Applications to engineering systems : machine motions, mechanisms, rotating structures.

BIBLIOGRAPHY

REQUIREMENTS

Point Mechanics