UNICUSANO
ROME

Code: ING-IND/13 **Credits: 9**
Matter: Applied Mechanics
Main language of instruction: Italian
Other language of instruction: English

Teaching Staff

Head instructor
Prof. Oliviero Giannini - oliviero.giannini@unicusano.it

Introduction

1. *Objective of the course :*

The course in Applied Mechanics aims to provide students with a good understanding of mechanics and its application to the study of machine behavior. The course introduces basic concepts of kinematics and dynamics and applies them to the study of mechanisms and, more broadly, common mechanical devices used in engineering, with a particular focus on dynamic issues and transient analysis. Additionally, the educational objective of the course is to give students a detailed knowledge of the operation of mechanical devices such as brakes and clutches, planar articulated systems, friction wheel and belt drives, lifting systems, ordinary and epicyclic gear trains. The e-tivities associated with the course develop the skills necessary to formulate mechanical problems using computational codes.

Objectives

The course provides the fundamentals for the kinematic , static, and dynamic analysis of mechanical systems of the type commonly found in machinery

Competencies:

The student should be able to write equation of motion of simple mechanical systems, discuss the motion and solve basic problems on kinematics and dynamics of mechanical systems of the type commonly found in machinery

Syllabus

1. *Kinematics*

   a. *Point Kinematics,*
   b. *Rigid body Kinematics,*
   c. *Constraints*
   d. *Planar relative motion*
2. *Forces in mechanical systems*
   a. *Equations of static equilibrium,*
   b. *Momentum and moment of momentum,*
   c. *Dynamics equations, Forces in mechanical systems,*
   d. *Free body diagram,*
   e. *Work and energy, impulse*
3. *Planar Mechanism*
   a. *Kinematics pairs,*
   b. *Computation of the dof of a mechanism,*
   c. *Kinematics of planar single-dof mechanisms,*
   d. *position, velocity and acceleration analyses*
4. *Friction*
   a. *Static and kinetic friction,*
   b. *Rolling friction,*
   c. *Modelling of friction in kinematic pairs*
5. *Friction devices*
   a. *Wear,*
   b. *brakes,*
   c. *clutch.*
6. *Cables, Pulleys and belt drives*
   a. *flat belts; trapezoidal belts,*
   b. *fixed and movable pulley;*
   c. *pulley system; block and tackle,*
   d. *belt drives*
7. *gears:*
   a. *Gear types, Involute spur gears: geometry, proportions and standards,*
   b. *Simple and compound gear trains,*
   c. *planetary gear trains*
8. *Machines*
   a. *Machines arranged in series and in parallel,*
   b. *Machine-load coupling,*
   c. *Flywheel calculations*

Evaluation system and criteria

The examination consists of a written test. This includes:

- 3 exercises (up to 22 out of 30 marks) and two open questions (up to 4 out of 30 marks).

In addition, the evaluation takes into account three e-tivities, consisting of numerical problems. These need to be sent to the instructor in advance of the examination. The e-tivity counts a total of 5 out of 30 marks

Bibliography and resources

Material provided by the teacher
Recommended bibliography:
C.FerraresieT.Raparelli. MeccanicaApplicata .Terzaedizione.Torino:CLUT,2007