Fundamentals of mechanical engineering

Academic Year: (2022 / 2023) **Review date: 16/05/2022 10:03:48**

Department assigned to the subject: Mechanical Engineering Department

Coordinating teacher: CASTEJON SISAMON, CRISTINA

Type: Compulsory ECTS Credits : 6.0

Year : 2 Semester : 2

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Physic I
Calculus
Linear Algebra
Mathematics Extension

OBJECTIVES

1. Have the knowledge and understanding of the fundamentals of the kinematic and dynamic of planar mechanisms and machines.
2. Have the ability to apply the knowledge and understanding to identify, formulate and solve problems of kinematics and dynamics of simple machines and mechanisms using established methods.
3. Have the ability to design and perform experiments in the theory of machines and mechanisms, interpret the data and obtain conclusions.
4. Have technical and laboratory competences in mechanism and machine theory.
5. Have the ability to select and use appropriate equipment, tools and methods to solve problems of kinematics and dynamics of simple mechanisms and machines.
6. Have the ability to combine theory and practice to solve problems of simple mechanisms and machines.
7. Have an understanding of methods and techniques applicable to the theory of mechanisms and machines and their limitations.

DESCRIPTION OF CONTENTS: PROGRAMME

1. Introduction to the Mechanism and machine science
   a. Mechanism, machine and structure. General diagram of a mechanical system.
   b. Transmission systems: classification
   c. Number of degrees of freedom of a mechanism
2. Topological analysis of mechanisms
   a. Parts of a mechanism
   b. Elementary pairs.
   c. Kinematic chains. Application to robotic mechanisms.
3. Kinematic analysis of mechanisms
   a. Generalized coordinates
   b. Kinematic mechanism analysis using loop equations
   c. Natural coordinates method. Raven's method.
4. Dynamic analysis of mechanisms
   a. Static analysis. Reduced force and balancing force.
   b. Principle of virtual powers. Obtaining the reaction forces
5. Dynamic analysis
   a. Principle of d'Alembert. Inertial force and inertial torque. Equivalent force
   b. Principle of superposition
6. Transmission systems.
   a. Gear transmission and gear boxes
   b. Cam mechanisms
   c. Other transmission systems (chains, belts and cables).

7. Introduction to the synthesis and design of spatial mechanism

LEARNING ACTIVITIES AND METHODOLOGY

THEORETICAL PRACTICAL CLASSES.
Knowledge and concepts students must acquire. Receive course notes and will have basic reference texts. Students partake in exercises to resolve practical problems.

TUTORING SESSIONS.
Individualized attendance (individual tutoring) or in-group (group tutoring) for students with a teacher. Subjects with 6 credits have 4 hours of tutoring/ 100% on- site attendance.

STUDENT INDIVIDUAL WORK OR GROUP WORK.
Subjects with 6 credits have 98 hours/0% on-site.

WORKSHOPS AND LABORATORY SESSIONS.
Subjects with 3 credits have 4 hours with 100% on-site instruction. Subjects with 6 credits have 8 hours/100% on-site instruction.

ASSESSMENT SYSTEM

% end-of-term-examination/test:	60
% of continuous assessment (assigments, laboratory, practicals…):	40

FINAL EXAM.
Global assessment of knowledge, skills and capacities acquired throughout the course. The percentage of the evaluation varies for each subject between 60% and 0%.

CONTINUOUS EVALUATION.
Assesses papers, projects, class presentations, debates, exercises, internships and workshops throughout the course. The percentage of the evaluation varies for each subject between 40% and 100% of the final grade.

BASIC BIBLIOGRAPHY

- A. Simón, A. Bataller, A.J. Guerra, J.A. Cabrero. Fundamentos de Teoría de Máquinas, Ed. Técnicas y Científicas, 2000

- J.C. García-Prada, C. Castejón, H. Rubio, J. Meneses Problemas resueltos de Teoría de Máquinas y Mecanismos 2ed., Thomson-Paraninfo, 2014

- R. Calero. Fundamentos de mecanismos y máquinas para ingenieros, E.T.S.I.I. Las Palmas de Gran Canaris, 1995