

MACHINE ELEMENTS

Code: 322075

Main Scientific Area: Mechanics and industrial processes

Lecturer: António João de Melo Martins de Araújo

Language of Instruction: Portuguese

Regime: S1

Contact Hours: 60h Total Workload: 105h

ECTS: 6,0

Objectives

Identify and understand the most important elements and structural components of mechanical machines involved in industrial equipment. Design components and structural elements most commonly used in mechanical machines.

Learning Outcomes

Understand the working principles of the most important elements and structural components of mechanical machines. Design components and structural elements of mechanical machines.

Course Contents

BASIC CONCEPTS

Major quantities (linear velocity, angular velocity, force, momentum, stress, power)

Conversion of units

Main machine components

Linear motion

Rotary movement

Transmission

TRANSMISSION

Belts (geometric relationships, gear ratio, forces)

Spur gears (geometry, gear ratios, force analysis)

Helical gears (geometry, force analysis)

Conical gears

Worm screws

Shafts

SPRINGS

Torsion bars

Helical tension and compression springs

Helical torsion springs Leaf springs

Recommended Bibliography

R. C. Juvinall, K. M. Marshek, Fundamentals of Machine Component Design, ed. 5, Willey, 2011

R. G. Budynas, J. K. Nisbett, Shigley's Mechanical Engineering Design, ed. 10, McGraw-Hill, 2014

A. C. Ugural, Mechanical Design: An Integrated Approach, ed. 1, McGraw-Hill, 2003

Learning and Teaching Methods

Initially the main quantities to the understanding of UC are reviewed, as well as their units. Next, the main mechanical machine components are studied, which are grouped into two fundamental groups: transmission and springs. The study of the machine components is guided by two vectors: selection of the most appropriate component to a pre-specified function; dimensioning of the component in order to ensure the correct operation for the function for which it is intended.

Assessment Methods

Three written class tests.