Course guide
820458 - EMQM - Machine Elements

Last modified: 04/06/2026

Unit in charge: Barcelona East School of Engineering
Teaching unit: 712 - EM - Department of Mechanical Engineering.

Degree: BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Optional subject).

Academic year: 2026 **ECTS Credits:** 6.0 **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer: EVA MARTÍNEZ GONZÁLEZ

Others: Primer quadrimestre:
EVA MARTÍNEZ GONZÁLEZ - Grup: T11, Grup: T12

Segon quadrimestre:
EVA MARTÍNEZ GONZÁLEZ - Grup: T11

PRIOR SKILLS

Knowledge of mechanics and strength of materials.

REQUIREMENTS

DISSENY DE MÀQUINES - Prerequisit

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Transversal:
1. EFFECTIVE USE OF INFORMATI0N RESOURCES - Level 3. Planning and using the information necessary for an academic assignment (a final thesis, for example) based on a critical appraisal of the information resources used.

TEACHING METHODOLOGY

Oral explanation of concepts, principles and calculation methods. Discussion of case studies when appropriate.

Course Description: The methods developed in statics, dynamics, and strength of materials are applied to the selection of basic machine components. The fundamental principles required for the selection of individual elements that compose a machine are developed.

LEARNING OBJECTIVES OF THE SUBJECT

1. Students will be able to design machine elements and systems of machine elements to successfully satisfy the function of the machine.
2. Students will be able use a written format to communicate engineering desgings in a professional manner.
3. Students will be able to apply principles of engineering, basic science and mathematics to model, analyze, design and realize physical systmes, components or processes, and work professionally in mechanical areas.

STUDY LOAD

Type	Hours	Percentage
Hours small group	15,0	10.00
Hours large group	45,0	30.00
Self study	90,0	60.00

Total learning time: 150 h

CONTENTS

Introduction to mechanical design

Description:
Introduction to the design concept and its role in the design of mechanical elements. Introduction to the design tree: Recognition of need -> Definition of the problem -> Summaries -> Analysis -> Improvement and Optimization -> Evaluation -> Presentation.

Specific objectives:
The student must be able to describe and recognize each stage of design.

Related activities:
Case presentation can clearly see where each of the phases described in the previous section and evaluate the importance from the different views of each stage.

Full-or-part-time: 15h
Theory classes: 6h
Guided activities: 7h
Self study : 2h

Machine Design: An Introduction and methodologies.

Description:
Apply the design concept to the field of machines and have different working methods conducive to solving the design. Be presented alternative assessment tools, modeling and analysis, and process documentation.

Specific objectives:
The student must be able to use different methodologies presented and evaluate the results.

Related activities:
On a case students have to work different design alternatives and make an assessment.

Full-or-part-time: 15h
Theory classes: 6h
Guided activities: 2h
Self study : 7h

Design of a subset of a machine.

Description:
Apply prior knowledge to cough on a known case where the subset is sufficient knowledge to be able to vary the design and qualitatively recognize his goodness.

Specific objectives:
The student should be able to complete the redesign of a subset and improvements made to establish them.

Related activities:
Re-designing a subset of a machine, simple and known, and qualitatively verify the result, so will have to use the techniques described so far in the subject.

Full-or-part-time: 15h
Theory classes: 6h
Guided activities: 2h
Self study : 7h

Standard elements

Description:
The most common standard elements in mechanical design will be presented. The economic importance and use of standard elements will be assessed.

Specific objectives:
The student must be able to recognize, choose and assess the common standard in the projects listed are in mechanical design projects, and to ensure a correct representation of the same. The use of commercial information in an appropriate manner for the student is expected.

Related activities:
There will be a simple design with the use of standard elements and without them, then assess the efficiency of its use. Remember its graphical representation

Full-or-part-time: 15h
Theory classes: 6h
Guided activities: 2h
Self study : 7h

Lubrication and bearings

Description:
The lubrication concepts and its importance in the machine functionality will be introduced. Introduction of: lubrication, wear and friction, and bearings. Within this section shall state the use of environmental legislation in this field.

Specific objectives:
The student must be able to select a lubricant and lubrication method in the field of machine design and must be able to select bearings that are most appropriate for the description of the problem. The use of commercial information in an appropriate manner for the student is expected.

Related activities:
Through a group project, the student will select the coupling system between pieces on relative motion and contact. Must reduce friction to levels of design and it must select a type of lubricant and suitable bearings.

Full-or-part-time: 15h
Theory classes: 6h
Guided activities: 2h
Self study : 7h

Bearings

Description:
Will present the coupling system based on your custom bearings and reduce the friction between mobile systems. Will be presented the way you work as resistant mechanism and what are the efforts that request.

Specific objectives:
The student must be able to select bearings, analyze the forces and movements must support that should be restricted. The use of commercial information in an appropriate manner for the student is expected.

Related activities:
The student will design a system of coupled shaft-hub commercial catalogs and select the best solution for it.

Full-or-part-time: 15h
Theory classes: 6h
Guided activities: 7h
Self study : 2h

Design of threaded joints

Description:
Will present the system of threaded fasteners, screw types, efforts suffer these unions and comparison with other types of joints fixed, removable or not.

Specific objectives:
The student must be able to design and verify a threaded connection and mechanically design elements that comprise it, screws, washers and females. The use of commercial information in an appropriate manner for the student is expected.

Related activities:
The student will design different screw connections, depending on the loads to be supported, the different types of materials to be bonded and how to work in the union.

Full-or-part-time: 15h
Theory classes: 6h
Practical classes: 2h
Self study : 7h

Spring design

Description:
Calculation of springs, compression and torsion, will be presented.

Specific objectives:
The student must be able to design the different types of springs described and selecting appropriate materials for their manufacture. The use of commercial information in an appropriate manner for the student is expected

Related activities:
The student analyzed on a case the possible variants as regards the use of springs.

Full-or-part-time: 15h
Theory classes: 6h
Practical classes: 2h
Self study (distance learning): 7h

Selecting electric motors

Description:
Will present different types of electric motor, a daily basis which are used as drive machine. Without going into details of the electric and magnetic design will explain the mechanical principle of operation. Also present the union of a motor and gearbox.

Specific objectives:
The student must be able to select an electric motor or a geared motor from a catalog business and therefore must be able to make appropriate use of commercial information that will be presented.

Related activities:
Given the usual parameters for selecting an electric motor, the student must select one engine between different commercial catalogs.

Full-or-part-time: 15h
Theory classes: 6h
Guided activities: 2h
Self study : 7h

European Directive on machines

Description:
Will present the legal framework of the European Union with regard to industrial machinery, the machinery directive and harmonized standards in force.

Specific objectives:
The student must be able to apply the existing regulatory framework for projects of the course, see what rules will apply. The use of legal information for the student is expected.

Related activities:
To ensure understanding and implementation capacity of the legislation in the field, propose different activities where they need to assess the implementation of regulations, which have to solve the formal part of the delivery of materials and a summary of standards activity effect for areas within the treated field.

Full-or-part-time: 15h
Theory classes: 6h
Guided activities: 2h
Self study : 7h

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GRADING SYSTEM

Any academic fraud, plagiarism or use or possession of unauthorised means in an assessment activity leads to a mark of zero (0) for the affected test or assignment. Furthermore, in accordance with the University's regulations, if disciplinary proceedings are initiated the subject is recorded as "Pending Assessment" until a decision is reached. These incidents are managed in accordance with the **Action Framework for Academic Integrity in Assessment at the UPC**.

Combined Tests/Examinations: 40% Tests will include problems and short answer questions.
Homework/Quizzes/Extra Credit: 30% Homeworks will be assigned each week.
Final Exam: 30 %

EXAMINATION RULES.

a) Assignments must be submitted at the beginning of class on the assigned due date. No late homework will be accepted.
b) Discussions of assignments with other students is encouraged and permitted; however, all homework and design project work turned in should represent the own student effort.
c) Homework should be done on DINA4 engineer0s paper and identified by: EMQ, course, student name, homework number and date. Computer printouts for homework solutions are accepted.
d) The group members must sign the group assignments (projects).