



Course guides

320059 - PMM - Project of Machines and Mechanisms

Last modified: 14/06/2020

Unit in charge: Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 712 - EM - Department of Mechanical Engineering.
709 - DEE - Department of Electrical Engineering.
729 - MF - Department of Fluid Mechanics.

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

Academic year: 2020 **ECTS Credits:** 6.0 **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer: Rafel Sitjar

Others: Rafael Sitjar.
Esteve Codina.
Sola De Las Fuentes, Gloria
Torrent Gelma, Miguel

PRIOR SKILLS

Students must have passed the course "Drives and transmissions" and it's recommended to have passed the course "Theory and design of machines and mechanisms".

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Transversal:

1. SELF-DIRECTED LEARNING - Level 2: Completing set tasks based on the guidelines set by lecturers. Devoting the time needed to complete each task, including personal contributions and expanding on the recommended information sources.
2. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 2. Using strategies for preparing and giving oral presentations. Writing texts and documents whose content is coherent, well structured and free of spelling and grammatical errors.
3. TEAMWORK - Level 2. Contributing to the consolidation of a team by planning targets and working efficiently to favor communication, task assignment and cohesion.

TEACHING METHODOLOGY

- Theoretical sessions and resolution of projects.
- Independent work and study projects.
- Preparation and evaluated activities in group.

LEARNING OBJECTIVES OF THE SUBJECT

To understand and apply the concepts learned in the undergraduate design of machines and mechanisms.
Provide technological solutions to the needs of mechanical design.
Documenting solutions following the rules.



STUDY LOAD

Type	Hours	Percentage
Hours medium group	30,0	20.00
Self study	90,0	60.00
Hours large group	30,0	20.00

Total learning time: 150 h

CONTENTS

TOPIC 0: Making a practical case

Description:

Making a project to practice the knowledge acquired in previous issues and develop memory, calculations, drawings, budget and documentation.

The project will have electrical and hydraulic actuators and each application will be developed and supervised by Hydraulic and Electrical departments.

Full-or-part-time: 90h

Self study : 90h

TOPIC 1: Commissioning of the project

Description:

Writing technical specifications of the project.
Dimensioning the start, end and control points.
Consignment project.
Distribution of tasks.
Search for information.

Full-or-part-time: 4h

Theory classes: 2h

Practical classes: 2h

TOPIC 2: Technical report

Description:

Description of objectives.
Project scope.
Analysis of the different solutions.
Regulations can be enforced.
Description of the solution chosen.

Full-or-part-time: 4h

Theory classes: 2h

Practical classes: 2h



TOPIC 3: Drawings

Description:

Consolidation Project.
Selection of levels criteria
Criteria for selection of surface finishes.
Selection of tolerances criteria.
Criteria for selection of materials and their treatments.
List of pieces.

Full-or-part-time: 16h

Theory classes: 4h
Practical classes: 4h
Self study : 8h

TOPIC 4: Calculations

Description:

Kinematic calculations.
Dynamic calculations.
Components dimensions

Full-or-part-time: 4h

Theory classes: 1h
Practical classes: 1h
Self study : 2h

TOPIC 5: Budgets

Description:

Detailed budget.

Full-or-part-time: 2h

Theory classes: 1h
Practical classes: 1h



TOPIC 6: Technical file

Description:

CE:

Instructions handbook
Maintenance handbook
Risk assessment.
Scrapping handbook
Manufacturing Listings
Manufacturing specifications
Specifications assembly
Lists of recommended spare parts
Lists of problems and solutions
Specifications for the machine inspection

Full-or-part-time: 22h

Theory classes: 5h

Practical classes: 5h

Self study : 12h

TOPIC 7.A: Electric complements

Description:

ELECTRICAL PROTECTION.

- The thermistor
- Save breaker motor protection.
- The differential protection and the associated problems.
- Selectivity of protection.

ELECTRICAL SCHEMES.

- Diagram of power.
- Outline command.
- PLC control and command. Hardware and Software.
- Monitoring and configuration items.

Related activities:

P7. - Programming the PLC according to specifications of the process, make the appropriate wiring diagrams.

Q6. - Protection with engine guard, assembly and test its operation.

Full-or-part-time: 15h

Theory classes: 2h

Practical classes: 7h

Self study : 6h



TOPIC 7.B: Hydraulic complements

Description:

Specialization in oil-hydraulic pump-cylinder couplings. Applied basically to conventional oleohydraulics, of the industrial sector.

Session 1) INTRODUCTION TO THE OLEOHYDRAULIC PROJECT

- 1.1) Dimensioning of actuators (cylinders and motors)
- 1.2) Characteristics of oleohydraulic cylinders
- 1.3) Interpretation of oleohydraulic plates
- 1.4) Oil hydraulics in the CE Technical File
 - 1.4.1) Directive EN2006 / 42 / EC
 - 1.4.2) Harmonized standard ISO 4413. Safety in oleohydraulic circuits
 - 1.4.3) ISO 13849. Safety control systems

(SELF-ASSESSMENT: Questionnaires)

Session 2) REVIEW CONTROL VALVES

- 2.1) Pressure regulating valves
- 2.2) Flow regulating valves
- 2.3) Distribution valves
- 2.4) Problem on valves

Session 3) FORCE CONTROL CIRCUITS

- 3.1) Typical circuits
- 3.2) Force control problems

Session 4) SPEED CONTROL CIRCUITS

- 4.1) Typical circuits
- 4.2) Speed control problems

Session 5) CIRCUITS WITH ACCUMULATOR

- 5.1) Accumulator theory
- 5.2) Accumulator problems

Session 6) LOAD RETENTION CIRCUITS

- 6.1) Piloted overcenter and non-return valves
- 6.2) Load retention problems

Full-or-part-time: 15h

Theory classes: 7h

Practical classes: 5h

Self study : 3h

GRADING SYSTEM

- 1st test : 25%
- 2nd test: 25%
- 3rd test: 25%
- Activities: 25%