Course guides
330523 - EME2 - Mechanical Engineering 2

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

Degree: BACHELOR’S DEGREE IN AUTOMOTIVE ENGINEERING (Syllabus 2017). (Compulsory subject).

Academic year: 2021  ECTS Credits: 4.5  Languages: Catalan, Spanish

LECTURER

Coordinating lecturer: Alcelay Larrión, José Ignacio
Others: Peña Pitarch, Esteban
        Al Omar Mesnaoui, Anas

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
1. Knowledge of the principles of theory of machines and mechanisms.
2. (ENG) Coneixements i capacitats per el càlcul, disseny i assaig de màquines.

Transversal:
3. TEAMWORK - Level 2. Contributing to the consolidation of a team by planning targets and working efficiently to favor communication, task assignment and cohesion.
4. 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.

TEACHING METHODOLOGY

MD1 Master class or lecture (EXP)
MD2 Problem solving and case study (RP)
MD5 Small-scale project, activity or assignment (PR)
MD7 Assessment activities (EV)

LEARNING OBJECTIVES OF THE SUBJECT

General objectives:
- Integrate the Mechanics and Mechanism Theory within the studies of Engineering using the previous knowledge imparted in the previous courses, working the own capacities of the engineering and doing it attractive and useful for the student body, whether they opt for a mechanical profile or not.
- To make students aware of the relationship between technology and society by analyzing the role that machines play in this binomial and the sustainability of the current model of human activity.

Specific:
- Carry out, from the concepts of rigid solid mechanics and basic and operative tools, kinematic analyzes, statics and dynamics of the mechanisms and of the machines.
- Use computer applications for the calculation and simulation of mechanisms.
- Recognize the basic mechanical elements and mechanical groups of machines and mechanisms from examples taken from real situations.
STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours small group</td>
<td>30,0</td>
<td>26.67</td>
</tr>
<tr>
<td>Hours large group</td>
<td>15,0</td>
<td>13.33</td>
</tr>
<tr>
<td>Self study</td>
<td>67,5</td>
<td>60.00</td>
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</tbody>
</table>

Total learning time: 112.5 h

CONTENTS

**Topic 1: MACHINE AND MECHANISM**

**Description:**

**Specific objectives:**
The activity consists in the problem solving oriented to the design by means of computer programs (spreadsheets, programs to solve equations and programs to draw graphs).

**Related activities:**
Solving specific exercises about the contents (Activity 1).

**Full-or-part-time:** 4h 30m
- Theory classes: 1h 30m
- Self study: 3h

**Topic 2: MOBILITY**

**Description:**

**Specific objectives:**
The activity consists in the problem solving oriented to the design by means of computer programs (spreadsheets, programs to solve equations and programs to draw graphs).

**Related activities:**
Solving specific exercises about the contents (Activity 1).

**Full-or-part-time:** 4h 30m
- Theory classes: 1h 30m
- Self study: 3h
### Topic 3: KINEMATICS OF MECHANISMS

**Description:**
Kinematic study of a mechanism from geometric link equations. Redundancy and unique configurations. Kinematics study of mechanisms from kinematic linking equations. Flat motion. Theorem of the three centers.

**Specific objectives:**
The activity consists in the problem solving oriented to the design by means of computer programs (spreadsheets, programs to solve equations and programs to draw graphs).

**Related activities:**
Solving specific exercises about the contents (Activity 1).
Individual evaluation. Written Assessment Test (PAE) (Activity 4)

**Full-or-part-time:** 9h
Theory classes: 3h
Self study : 6h

### Topic 4: GEARS AND GEAR TRAINS

**Description:**

**Specific objectives:**
The activity consists in the problem solving oriented to the design by means of computer programs (spreadsheets, programs to solve equations and programs to draw graphs).

**Related activities:**
Solving specific exercises about the contents (Activity 2).
Individual evaluation. Written Assessment Test (PAE) (Activity 4)

**Full-or-part-time:** 9h
Theory classes: 3h
Self study : 6h

### Topic 5: DYNAMIC ANALYSIS

**Description:**

**Specific objectives:**
The activity consists in the problem solving oriented to the design by means of computer programs (spreadsheets, programs to solve equations and programs to draw graphs).

**Related activities:**
Solving specific exercises about the contents (Activity 3).
Individual evaluation. Written Assessment Test (PAE) (Activity 4).

**Full-or-part-time:** 9h
Theory classes: 3h
Self study : 6h
### ACTIVITIES

<table>
<thead>
<tr>
<th>Activity 1: kinematics of mechanisms</th>
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<tbody>
<tr>
<td><strong>Description:</strong> Do exercises related to topics 1, 2 and 3.</td>
</tr>
<tr>
<td><strong>Specific objectives:</strong> At the end of this activity the student must be able to: Be able to clearly determine the degrees of freedom of a mechanism. To be able to determine positions, speeds and accelerations of the elementary mechanisms, using computer programs. To work autonomously and in team and to communicate effectively and clearly the obtained results.</td>
</tr>
<tr>
<td><strong>Material:</strong> Documents in the Atenea virtual campus. Compulsory reading list.</td>
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<tr>
<td><strong>Full-or-part-time:</strong> 28h Laboratory classes: 13h Self study: 15h</td>
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<table>
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<tr>
<th>Activity 2: gears and gear trains</th>
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<tbody>
<tr>
<td><strong>Description:</strong> Do exercises related to topic 4.</td>
</tr>
<tr>
<td><strong>Specific objectives:</strong> At the end of this activity the student must be able to: Know, analyze and differentiate the different types of gears used. Calculate the transmission ratios between the different axes and differentials studied. Work autonomously and as a team and communicate effectively and clearly the results obtained.</td>
</tr>
<tr>
<td><strong>Material:</strong> Documents in the Atenea virtual campus. Compulsory reading list.</td>
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<tr>
<td><strong>Full-or-part-time:</strong> 18h 30m Laboratory classes: 8h Self study: 10h 30m</td>
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<tr>
<th>Activity 3: mechanism dynamics</th>
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<td><strong>Description:</strong> Do exercises related to topic 5.</td>
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<tr>
<td><strong>Specific objectives:</strong> At the end of this activity the student must be able to: Interpret the theoretical concepts studied and apply them to the dynamic analysis of the mechanisms used in the activity. Work independently and as a team and communicate effectively and clearly the results obtained.</td>
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<tr>
<td><strong>Material:</strong> Documents in the Atenea virtual campus. Compulsory reading list.</td>
</tr>
<tr>
<td><strong>Full-or-part-time:</strong> 19h Laboratory classes: 9h Self study: 10h</td>
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Activity 4: Individual evaluation. Written Assessment Test (PAE)

Description:
Carry out an individual written test of the course contents.

Specific objectives:
At the end of this activity the student must be able to: know, understand and apply the concepts studied in the theoretical sessions and lab sessions.

Material:
Scientific calculator.

Full-or-part-time: 11h
Theory classes: 3h
Self study: 8h

Activity 5: Individual evaluation. New Written Assessment Test (NPAE)

Description:
Carry out an individual written test of the course contents.

Specific objectives:
At the end of this activity the student must be able to: know, understand and apply the concepts studied in the theoretical sessions and lab sessions.

Material:
Scientific calculator.

Full-or-part-time: 3h
Theory classes: 3h

GRADING SYSTEM

Activity 1 (A1): 10%
Activity 2 (A2): 10%
Activity 3 (A3): 10%
Activity 4 (PAE): 70%
Activity 5 (NPAE): 70%
- Delivery of the Proposed Problems (Activity 1, 2 and 3): 30%
- Individual Test of Written Evaluation (PAE) (Activity 4): 70%
- NFinal (NF) = 10% (A1) + 10% (A2) + 10% (A3) + 70% (PAE)
If the student obtains an NF > = 4.95, pass.
Students who fail to pass the subject or those who want to improve their qualification, they will have a second chance with a New Final Written Test (NPFE), which will replace PAE and which will have a value of 70%.
The New Final Grade (NNF) = + 10% (A1) + 10% (A2) +10 % (A3) + 70% (NPAE))
Thus, the Final Mark of the Subject = MAX (NF: NNF).
Attendance to class and participation.
BIBLIOGRAPHY

Basic:

Complementary: