340636 - FOME-R1P12 - Mechanical Fundamentals

Coordinating unit: 340 - EPSEVG - Vilanova i la Geltrú School of Engineering
Teaching unit: 712 - EM - Department of Mechanical Engineering
Academic year: 2019
Degree: MASTER’S DEGREE IN AUTOMATIC SYSTEMS AND INDUSTRIAL ELECTRONICS (Syllabus 2012).
(Teaching unit Optional)
ECTS credits: 5 Teaching languages: Spanish

Teaching staff
Coordinator: Maurici Sivatte
Others: Maurici Sivatte

Degree competences to which the subject contributes

Specific:
2. CC09 - Identify the symbols of mechanical systems and obtain the knowledge to determine the number of drives that will allow the desired movement of the system.

Transversal:
1. EFFECTIVE USE OF INFORMATION RESOURCES. Managing the acquisition, structure, analysis and display of information from the own field of specialization. Taking a critical stance with regard to the results obtained.

Teaching methodology

Classes of theory and problems
Lab.

Learning objectives of the subject

Mechanical systems are the material basis of automation, per therefore an Automàtica i ingieniero in industrial electronics, must understand their movimento, transmission and causes that generate it. The objective of this course is to convey to students these skills.

Study load

<table>
<thead>
<tr>
<th>Total learning time: 45h</th>
<th>Hours large group: 30h</th>
<th>66.67%</th>
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<tbody>
<tr>
<td></td>
<td>Hours small group: 15h</td>
<td>33.33%</td>
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</table>
# Characterization of Mechanisms

**Description:**
- Cinematic elements
- Degrees of freedom
- Schematization

**Related activities:**
- CLASS THEORY AND PROBLEMS
- LABORATORY PRACTICE
- LEARNING ASSESSMENT

**Specific objectives:**
- Introduce students to the symbolism of the mechanical systems and gain the knowledge to determine the number of drives that will allow the desired motion of the system.
- Acquire the concepts of machine, mechanism, kinematic chain element and kinematic pair.
- Identify and classify the pairs of a mechanism.
- Calculate and analyze the degrees of freedom and mobility of a mechanism.
- Understand the meaning of the reference system.
- Training for outlining kinematic mechanisms.
- Mastering the concept of kinematic equivalence.

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# Elements of Machines

**Description:**
- Transmission Axes. Elements of Union
- Gears and Gear Trains
- Belts and Transmission Chains
- Bearings and Bearings
- Brakes and Clutches
- Springs. Linear guides. Actuators

**Related activities:**
- CLASS THEORY AND PROBLEMS
- LABORATORY PRACTICE
- LEARNING ASSESSMENT

**Specific objectives:**
The objective is to understand and know how to analyze the main elements of machines
### Space kinematics

**Learning time:** 17h 30m  
- Theory classes: 4h  
- Laboratory classes: 3h  
- Self study: 10h 30m

**Description:**  
Calculation of velocities in spatial mechanisms.  
Calculation of accelerations in spatial mechanisms.

**Related activities:**  
CLASS THEORY AND PROBLEMS  
LABORATORY PRACTICE  
LEARNING ASSESSMENT

**Specific objectives:**  
Understand and calculate the general movement of spatial mechanisms, from a cinematic point of view.

### Space Dynamics

**Learning time:** 20h  
- Theory classes: 2h  
- Laboratory classes: 6h  
- Self study: 12h

**Description:**  
Newton's laws. Diagram of the free body.  
Resolution of static and dynamic problems.

**Related activities:**  
THEORY CLASSES AND PROBLEMS  
LABORATORY PRACTICES  
LEARNING ASSESSMENT

**Specific objectives:**  
Identify the causes of movement.  
Represent and interpret vectorially the state of exterior solicitations of a spatial mechanical system.  
Solve the calculation of the stresses that cause movement in the space mechanical systems.
### Planning of activities

<table>
<thead>
<tr>
<th>THEORY CLASSES AND PROBLEMS</th>
<th>Hours: 33h</th>
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<tbody>
<tr>
<td><strong>Description:</strong></td>
<td></td>
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<tr>
<td>Classroom work</td>
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<tr>
<td><strong>Support materials:</strong></td>
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<td>Notes from the Digital Campus</td>
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<tr>
<td>Transparencies</td>
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<tr>
<td><strong>Specific objectives:</strong></td>
<td></td>
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<tr>
<td>Know the symbology of the mechanical systems and obtain the knowledge to be able to determine the number of drives that will make possible the desired movement of the System</td>
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<tr>
<td>Know and calculate the main elements of machines</td>
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<tr>
<td>Acquire the ability to generate and solve the equations of motion for the mechanical space systems</td>
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<table>
<thead>
<tr>
<th>LABORATORY PRACTICE</th>
<th>Hours: 15h</th>
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<tr>
<td><strong>Description:</strong></td>
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<tr>
<td>Conduct by the student of practical work and mechanical computer simulations</td>
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<tr>
<td><strong>Support materials:</strong></td>
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<tr>
<td>Computer and software simulation</td>
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<tr>
<td>Mechanical models</td>
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<tr>
<td><strong>Specific objectives:</strong></td>
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<tr>
<td>Perform model analysis of a mechanism and simulate its movements to solve cinematic and dynamic analysis and design problems</td>
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<tr>
<th>LEARNING ASSESSMENT</th>
<th>Hours: 5h</th>
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<td><strong>Description:</strong></td>
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<tr>
<td>Individual written tests</td>
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<tr>
<td><strong>Specific objectives:</strong></td>
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<tr>
<td>Certify the level of achievement of learning</td>
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The final grade (QF) of the subject is obtained from the expression:

\[ QF = 0.25 \times \text{Rated Practice} + 0.75 \times \text{Rated Final Exam}. \]

Evaluation acts and weight are:

1st act of evaluation (weight 0.25):
Practices (realitzadas in mechanical laboratoroi in groups of two students with teacher support. Subsequently a report that will help you deliver the QUALIFICATION is.)

2on act of evaluation (weight 0.75):
Final Exam. (includes tota matter)

Only this second evaluative act will be Reassessable

**Bibliography**

**Basic:**


