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: 2018
Degree: MASTER'S DEGREE IN AUTOMATIC SYSTEMS AND INDUSTRIAL ELECTRONICS (Syllabus 2012).
(Teaching unit Optional)
ECTS credits: 5
Teaching languages: Catalan

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:</th>
<th>30h</th>
<th>66.67%</th>
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<tbody>
<tr>
<td>Hours small group:</td>
<td>15h</td>
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<td>33.33%</td>
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### Introduction to Mechanical Systems

**Learning time:** 13h  
- Theory classes: 8h  
- Laboratory classes: 2h  
- Self study: 3h

**Description:**  
Definition of System Mechanic. Kinematic scheme.  
Powertrain. Investment kinematic mechanisms.  
Outlining

**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.

### Kinematics. The movement in mechanical systems.

**Learning time:** 19h 30m  
- Theory classes: 7h  
- Laboratory classes: 2h  
- Self study: 10h 30m

**Description:**  
Fundamental movements. Composition of movement.  
Calculating velocities planar mechanisms. Cinema of speeds.  
Calculating accelerations planar mechanisms. Cinema of accelerations.

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

**Specific objectives:**  
Understand and calculate the overall motion of mechanisms, from a cinematic point of view:  
Calculating the angular and linear velocities of mechanisms.  
Calculate the angular and linear accelerations mechanisms  
Of solving relative motion mechanisms
### Static and dynamic. Causes of motion in mechanical systems

<table>
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<td>Theory classes:</td>
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<tr>
<td>Laboratory classes:</td>
<td>2h</td>
</tr>
<tr>
<td>Self study:</td>
<td>10h 30m</td>
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**Description:**
- Newton's Laws. Free body diagram.
- Troubleshooting static theorems using vector (Newton) and principle of virtual powers.
- Troubleshooting dynamics through fictitious inertial forces (d' Alembert).
- Troubleshooting using the dynamic principle of virtual powers.
- Troubleshooting by Dynamic Energy Theorem.

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

**Specific objectives:**
- Understand and calculate the forces that cause movement in mechanical systems.
- Identify the causes of motion.
- Vectorially represent and interpret the state of external stresses in a mechanical system.
- Calculating solve stresses which cause movement in the mechanical systems.
# Planning of activities

| **(ENG) CLASSES TEORIA I PROBLEMES** | **Hours: 33h**  
| Theory classes: 33h |
| **Description:** | Classroom work |
| **Support materials:** | Notes from the Digital Campus  
| | Transparencies |
| **Specific objectives:** | Meet the symbolism of mechanical systems and get the knowledge to determine the number of drives that will allow the desired motion of the system  
| | Acquiring the ability to generate and solve the equations of motion for mechanical systems multi body |

| **LABORATORY PRACTICE** | **Hours: 10h**  
| Laboratory classes: 10h |
| **Description:** | Conduct by the student of practical work and mechanical computer simulations |
| **Support materials:** | Computer and software simulation  
| | Mechanical models |

| **LEARNING ASSESSMENT** | **Hours: 2h**  
| Guided activities: 2h |
| **Description:** | Individual written tests |
| **Specific objectives:** | Certify the level of achievement of learning |
Qualification system

The final grade (QF) of the subject is obtained from the expression:
QF = 0.25 x + 0.75 x Rated Practice 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.)
2nd act of evaluation (weight 0.75):
Final Exam. (includes tota matter)
Only this second evaluative act will be Reassessable

Regulations for carrying out activities

Without documentation
No calculator
Bibliography

Basic:

- J. Shigley. Elementos de Máquinas.