340083 - DIME-D6O12 - Mechanism Design

Coordinating unit: 340 - EPSEVG - Vilanova i la Geltrú School of Engineering
Teaching unit: 712 - EM - Department of Mechanical Engineering
Academic year: 2018
Degree: BACHELOR'S DEGREE IN INDUSTRIAL DESIGN AND PRODUCT DEVELOPMENT ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
ECTS credits: 6
Teaching languages: Spanish

Teaching staff
Coordinator: AMELIA NÁPOLES ALBERRO

Prior skills
Previous concepts on which the subject has been planned:
- The academic contents of the subject "Mechanics" (MECA).
- The academic contents of the subject "Computer Assisted Design" (DIAO).

Requirements
Have satisfaction achieved the subjects:
"Mechanics" (MECA)
"Computer Assisted Design" (DIAO).

Degree competences to which the subject contributes

Specific:
1. D6. Ability to analyze and model kinematics and dynamic behavior of mechanical systems.
2. D7. Ability to simulate and design mechanisms as a solution for specific mechanical problems.

Transversal:
5. EFFECTIVE USE OF INFORMATION 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
The face-to-face sessions are divided into theory classes, problems and laboratory practices. The theory and problem classes integrate the expositions of the basic theoretical concepts of the thematic contents of the subject and describe examples applied in the form of exercises. In the practical classes the mobility of the models available in the laboratory is studied, and the mechanisms available in video are studied, and the behavior is analyzed through tasks set by the teacher.

Learning objectives of the subject
When finishing the subject, the student has to be able to:
- Analyze and relate the solicitations, efforts and motion in mechanical systems.
- Analyze and design mechanisms as a result of a specific problem of motion.
## Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group: 45h</th>
<th>30.00%</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group: 0h</td>
<td>0.00%</td>
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<tr>
<td></td>
<td>Hours small group: 15h</td>
<td>10.00%</td>
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<tr>
<td></td>
<td>Guided activities: 0h</td>
<td>0.00%</td>
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<tr>
<td></td>
<td>Self study: 90h</td>
<td>60.00%</td>
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</tbody>
</table>
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## Content

| 1-Geometry of mechanisms | Learning time: 45h  
Theory classes: 45h |
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td><strong>Description:</strong> Recapitulation of Conceptes adquisides in l'asignatura MECA, on Geometry dels mechanisms: Definicions. Cinematic parells. Equivalent Mecanism Schematics. He invented cinematic. Graus de llibertat. Criteria of Grübler i de Kutzbach.</td>
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</table>

| 2-Synthesis of Mechanisms. | Learning time: 36h  
Theory classes: 11h 15m  
Laboratory classes: 3h 45m  
Self study : 21h |
|---------------------------|---------------------|

| 3-Kinematic and dynamic analysis of mechanisms. | Learning time: 36h  
Theory classes: 11h 15m  
Laboratory classes: 3h 45m  
Self study : 21h |
|-----------------------------------------------|---------------------|
| **Description:** 3.1 Analysis of mechanisms.  
3.2 Speed and acceleration in mechanisms.  
**Specific objectives:** At the end of this teaching unit, the student must be able to: - Perform cinematic study of mechanisms. |

| 4-Transmission of forces into mechanisms. | Learning time: 45h  
Theory classes: 45h |
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td><strong>Description:</strong> Graphical decomposition of forces.</td>
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</table>
### Planning of activities

<table>
<thead>
<tr>
<th>Activity</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A1. AVALUACIÓ DE L’APRENETATGE</strong></td>
<td>6h</td>
</tr>
<tr>
<td><strong>A2. PRÀCTIQUES</strong></td>
<td>12h</td>
</tr>
<tr>
<td><strong>A3. PRESENTACIÓ D'INFORMES</strong></td>
<td>1h</td>
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</tbody>
</table>

### Qualification system

- Laboratory practices 10%
- Partial Evaluation 45%
- Final Evaluation 45%

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**5-Dynamic analysis of flat mechanisms.**

**Learning time:** 45h
- Theory classes: 45h

**Description:**
- Application of the energy theorem.
- Application of the D’Alembert’s method: Free body diagram and virtual Powers

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**Planning of activities**

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<th>Hours</th>
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<tr>
<td><strong>A1. AVALUACIÓ DE L’APRENETATGE</strong></td>
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<tr>
<td>Theory classes: 6h</td>
<td></td>
</tr>
<tr>
<td><strong>A2. PRÀCTIQUES</strong></td>
<td>12h</td>
</tr>
<tr>
<td>Practical classes: 12h</td>
<td></td>
</tr>
<tr>
<td><strong>A3. PRESENTACIÓ D'INFORMES</strong></td>
<td>1h</td>
</tr>
<tr>
<td>Guided activities: 1h</td>
<td></td>
</tr>
</tbody>
</table>

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**Description:**
- Each of the six sessions of laboratory is developed in a small group of 20 students. The objective of these sessions is to reinforce, individually, those theoretical concepts worked on the learning activities, both inside and outside the classroom, based on the resolution of the mechanism assigned individually.

**Descriptions of the assignments due and their relation to the assessment:**
- Study of the mechanism assigned individually.
  - Attendance is mandatory.
  - The student will deliver in each practice session the activity set out in the document "DIME Tasca Librar Instructions" in the folder DIME Videos Mechanisms in Google Drive, through the link: https://drive.google.com/drive/folders/1-9nG2lVM28dhyeyyo8T4qyVg_o9ni9Tt?usp=sharing
  - In the practice session the teacher reviews the solution and assigns the note for each of the stages.

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**Theory classes:**
- 6h

**Practical classes:**
- 12h

**Guided activities:**
- 1h
**Regulations for carrying out activities**

Standards for exams:
- You should not use notes, or calculator, not mobiles.
- Do not write in pencil and red color.
Other conditions of completion of each test will be specified, in each case, with sufficient notice.

**Bibliography**

**Basic:**


**Complementary:**


**Others resources:**

1. "DRIVE.GOOGLE" shared server:
   https://drive.google.com/drive/folders/1uy4axrpy1sTHk5SAS0QRczlW0hYB-00g?usp=sharing
   In this link, the student can download two information for the study.
   I. "Multimedia folder for self-learning mechanisms" folder.
      • This study material, allows to study the theoretical concepts interactively (consult it before the start of each topic). In addition, the MEDIACATECA must be consulted, which is useful for understanding the movements in the mechanisms.
      • Run file *.EXE: Program Player klcodec345
      • Run Interactive file.swf
   II. DIME Videos Mechanisms:
      • Gallery of mechanisms and Guide with information to perform the Deliverable Assignment.

2. Digital campus "ATENEA": Documentation to track the subject:
   a) Slides class: https://ocw.upc.edu/curs_publicat/820429/2015/1/apunts
   b) Weekly dedication guide: Before the theory class, the student must study the theoretical concepts indicated. In theory classes, emphasis will be placed on the theoretical aspects and exercises will be developed.
   c) Collection of exams.