Course guide 340083 - DIME-D6O12 - Mechanism Design

Unit in charge: Vilanova i la Geltrú School of Engineering
Teaching unit: 712 - EM - Department of Mechanical Engineering.

Degree: BACHELOR'S DEGREE IN INDUSTRIAL DESIGN AND PRODUCT DEVELOPMENT ENGINEERING (Syllabus 2009). (Compulsory subject).

Academic year: 2022  ECTS Credits: 6.0  Languages: Spanish

LECTURER

Coordinating lecturer: AMELIA NÁPOLES ALBERRO
Others: ANTONIO SÁNCHEZ EGEA

PRIOR SKILLS

Previous concepts on which the subject has been planned:
- The academic contents of the subject "Mechanics" (MECA).

REQUIREMENTS

Have satisfaction achieved the subjects:
"Mechanics" (MECA)

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:
07 AAT N2. 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.
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 calculate the kinematics of the mechanisms as a result of a specific movement problem.
- Analyze and relate the forces and Torques transmitted during movement in the mechanism.
- Analyze and solve the design of a mechanism applying the synthesis criteria.
<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours small group</td>
<td>15,0</td>
<td>10.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>45,0</td>
<td>30.00</td>
</tr>
<tr>
<td>Self study</td>
<td>90,0</td>
<td>60.00</td>
</tr>
</tbody>
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**Total learning time:** 150 h

**CONTENTS**

1- **Geometry of mechanisms**

**Description:**

**Full-or-part-time:** 45h
Theory classes: 45h

2- **Kinematic and dynamic analysis of mechanisms.**

**Description:**
2.1 Analysis of mechanisms.
2.2 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.

**Full-or-part-time:** 36h
Theory classes: 11h 15m
Laboratory classes: 3h 45m
Self study: 21h

3- **Synthesis of Mechanisms.**

**Description:**

**Full-or-part-time:** 36h
Theory classes: 11h 15m
Laboratory classes: 3h 45m
Self study: 21h
4-Transmission of forces into mechanisms.

Description:
Graphical decomposition of forces.
Calculation of the actions on the different points connected to the bench.

Full-or-part-time: 45h
Theory classes: 45h

5-Dynamic analysis of flat mechanisms.

Description:
Consideration of the inertia of the bars. D'Alembert's theorem.
Calculation of forces and motor or resistive torques by the Virtual Powers Method
Calculation of forces and pairs transmitted to the bench by the Free Body Diagram Method (dcl)

Full-or-part-time: 45h
Theory classes: 45h

GRADING SYSTEM

Laboratory practices 25%
Partial Evaluation 30%
Final Evaluation 45%
Re Evaluation 75%
For the approval of the subject it is necessary to carry out and present the reports of 80% of the laboratory practices.

EXAMINATION RULES

Standards for exams:
- The Re-evaluation includes all the content of the subject.
- You should not use notes, or calculator, not mobiles.
- Do not write in red color.
Other conditions of completion of each test will be specified in Atenea, with sufficient notice.

BIBLIOGRAPHY

Basic:

Complementary:
RESOURCES

Other resources:
1. "DRIVE.GOOGLE" shared server:
   https://drive.google.com/drive/folders/1uy4axrpy1sTHkSSAE0QRcziW0hYB-OOg?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.