DEGREE CURRICULUM

THEORY OF MECHANISMS

Coordination: ROCA ENRICH, JOAN

Academic year 2016-17

THEORY OF MECHANISMS 2016-17

Subject's general information

<table>
<tr><td>Subject name</td><td>THEORY OF MECHANISMS</td></tr>
<tr><td>Code</td><td>102110</td></tr>
<tr><td>Semester</td><td>1st Q(SEMESTER) CONTINUED EVALUATION</td></tr>
<tr><td>Typology</td><td>
<table>
<tr><th>Degree</th><th>Course</th><th>Typology</th><th>Modality</th></tr>
<tr><td>Bachelor's Degree in Automation and Industrial Electronic Engineering</td><td>2</td><td>COMPULSORY</td><td>Attendance-based</td></tr>
<tr><td>Bachelor's Degree in Mechanical Engineering</td><td>2</td><td>COMPULSORY</td><td>Attendance-based</td></tr>
<tr><td>Master's Degree in Industrial Engineering</td><td></td><td>COMPLEMENTARY TRAINING</td><td>Only examination</td></tr>
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<tr><td>ECTS credits</td><td>6</td></tr>
<tr><td>Groups</td><td>2GG,5GM</td></tr>
<tr><td>Theoretical credits</td><td>3</td></tr>
<tr><td>Practical credits</td><td>3</td></tr>
<tr><td>Coordination</td><td>ROCA ENRICH, JOAN</td></tr>
<tr><td>Department</td><td>INFORMATICA I ENGINYERIA INDUSTRIAL</td></tr>
<tr><td>Teaching load distribution between lectures and independent student work</td><td>Attendance work: 40 %
Autonomous work: 60 %</td></tr>
<tr><td>Important information on data processing</td><td>Consult this link for more information.</td></tr>
<tr><td>Language</td><td>Catalan. Also some material in spanish or in english</td></tr>
<tr><td>Office and hour of attention</td><td>Joan Roca Enrich Monday, 12 to 13. Wednesday, 17 to 18
Martí Comellas Andrés Monday, 17 to 18. Thursday, 12 to 13
Xavier Terribas Sala</td></tr>
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THEORY OF MECHANISMS 2016-17

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
ROCA ENRICH, JOAN	jroca@diei.udl.cat	6	Office 0.07 in building CREA Monday, from 12:00 to 13:00 Wednesday, from 17:00 to 18:00
TERRIBAS SALA, XAVIER		15	Office 1.12 in building CREA Wednesday, from 16:00 to 17:00

Subject's extra information

The main background needed to take advantatge of the subject are: operations with vectors, trigonometry, derivatives and integrals of one variable, graphical representation of multi-body systems, dynamics of a mass particle

It is essential to have studied previously, and it is advisable to have passed, the following subjects:

- Linear Algebra

- Calculus

- Physics I

- Graphics Expression I

Learning objectives

- Get a deeper knowledge about rigid body mechanics
- Analyze the typology and the constituent elements of a mechanism
- Study the possibilities of movement of a given mechanism
- Analyze the kinematics of a mechanism, corcerning positions, speeds and accelerations
- Analyze the dynamics of a mechanism at a given instant
- Analyze the dynamics of a mechanism considering the evolution between two specific situations

Competences

Cross-disciplinary competences

- **EPS1**. Capacity to solve problems and prepare and defence arguments inside the area of studies.
- **EPS2**. Capacity to gather and interpret relevant data, within the area of study, to judge and think about relevant subjects of social, scientific and ethical nature.
- **EPS7**. Capacity to work in situations with a lack of information and/or under pressure.

Specific competences

- **GEM13**. Knowledge of the principles of theory of machines and mechanisms.

Subject contents

1. Rigid body kinematics
2. Rigid body dynamics: momentum and angular momentum
3. Introduction to mechanisms
4. Mobility of mechanisms
5. Mechanism kinematics
6. Mechanism dynamics: vectorial theorems
7. Energy theorem apllied to mechanism dynamics

Methodology

Lectures: They will take place during the Full Group sessions. Explanation of theoretical content and proposal and/or resolution of some practical examples.

Problems: They will take place during the Half Group sessions. Approach and discussion of some problems that the students will solve individually or in groups.

Practices: They will take place during the Half Group sessions. 2 Practices at the Mechanics laboratory, analysing and measuring variables of mechanical systems, 1 practice about graphical kinematics using CAD.

Work in group: Development of 2 works about kinematic and dynamic analysis of different systems.

Development plan

Week	Methodology	Unit	Attendance hours	Autonomous work hours
1	Lectures	Unit 0: Introduction	2	0
2	Lectures Problems	Unit 1: Theory Unit 1: Problems	2 2	4
3	Lectures Problems	Unit 1: Theory Unit 1: Problems	2 2	4
4	Lectures Problems	Unit 2: Theory Unit 2: Problems	2 2	4
5	Lectures Practice	Unit 2: Theory Practice 1	2 1	6
6	Lectures Problems	Unit 3: Theory Unit 3: Problems	2 2	4
7	Lectures Problems	Unit 4: Theory Unit 4: Problems	2 2	4
8	Lectures Practice	Unit 4: Theory Practice 2	2 1	6
9	Evaluation	Exam 1	2	5

10	Lectures Problems	Unit 5: Theory Unit 5: Problems	2 2	6
11	Lectures Practice	Unit 5: Theory Practice 3	2 2	8
12	Lectures Problems	Unit 6: Theory Unit 6: Problems	2 2	6
13	Lectures Problems	Unit 6: Theory Unit 6: Problems	2 2	6
14	Lectures Problems	Unit 7: Theory Unit 7: Problems	2 2	6
15	Lectures Problems	Unit 7: Theory Unit 7: Problems	2 2	6
16-17	Evaluation	Exam 2	2	7
18	Tutoring	Tutoring	2	4
19	Evaluation	Recovery exam	2	4

Evaluation

There will be several evaluation activities:

- 1st individual written exam (week 9). The content to be evaluated is the one exposed and worked in class up to the date of this exam.
- Reports from the practice sessions, to be held in groups of 3-4 students. Practice sessions are mandatory
- 2 works in group about kinematic and dynamic analysis
- 2on individual written exam (week 16 or 17). The content to be evaluated is mainly the one exposed and worked in class between written exam 1 and written exam 2. A minimum mark of 3,5 out of 10 must be reached to pass the subject.
- Recovery exam of the 2nd individual one, with the same minimum mark

The weight assigned to each evaluation activity, out of 100, is as follows:

Activity	**Weight**
1st individual exam	20
Practice sessions and reports	10
Work in group	10+10
2nd individual exam	50
Recovery exam of the 2nd individual one	50

Note: if the minimum mark of 3,5 is not reached on the 2nd individual exam or on the recovery one, the subject mark will be the minimum between the result of the percentages of the table above and 3,5.

Bibliography

Lecture notes about the subject

BEDFORD, A. & FOWLER, W. (1996) *Mecánica para Ingeniería. Dinámica*. Addison-Wesley Iberoamericana.E.U.A.

BEER, F.P. & JOHNSTON, E.R. (1998) *Mecánica Vectorial para ingenieros. Dinámica*. McGraw Hill.

HIBBELER, R.C.(1996) *Ingeniería Mecánica. Dinámica*.Prentice-Hall Hispanoamericana. México.

MERIAM, J.L. & KRAIGE, L.G.(1998) *Engineering Mechanics. Dynamics*.John Wiley & Sons. USA.

MYSZKA,D. (1998) *Machines and Mechanisms. Applied Kinematic Analysis*. Prentice Hall. New Jersey.

CARDONA, S. et al. (1998) *Teoria de Màquines*. Ed. CPDA-ETSEIB.Barcelona.

MABIE, H & REINHOLTZ, C. (1998) *Mecanismos y Dinámica de Maquinaria*. Limusa.México.

RIBA, C. (1995) *Dissenyde Màquines I. Mecanismes*. Edicions UPC. Barcelona.

NORTON, R.L. (1995) *Diseño de Maquinaria*. McGraw Hill. México.

SHIGLEY & MISCHKE.*Diseño en Ingeniería Mecánica*. McGraw Hill.