



Universitat de Lleida

## DEGREE CURRICULUM

# THEORY OF MACHINES

Coordination: ROCA ENRICH, JOAN

Academic year 2017-18

## Subject's general information

<b>Subject name</b>	THEORY OF MACHINES			
<b>Code</b>	102303			
<b>Semester</b>	1st Q(SEMESTER) CONTINUED EVALUATION			
<b>Typology</b>	Degree	Course	Typology	Modality
	Bachelor's Degree in Mechanical Engineering	3	COMPULSORY	Attendance-based
	Master's Degree in Industrial Engineering	1	COMPLEMENTARY TRAINING	Attendance-based
<b>ECTS credits</b>	6			
<b>Groups</b>	1GG,2GM,5GP			
<b>Theoretical credits</b>	3			
<b>Practical credits</b>	3			
<b>Coordination</b>	ROCA ENRICH, JOAN			
<b>Department</b>	INFORMATICA I ENGINYERIA INDUSTRIAL			
<b>Teaching load distribution between lectures and independent student work</b>	Presencial: 40 % Treball autònom: 60 %			
<b>Important information on data processing</b>	Consult <a href="#">this link</a> for more information.			
<b>Language</b>	Catalan. Part of the course materials can be in Spanish and English.			
<b>Office and hour of attention</b>	Joan Roca Enrich. Dimarts de 12 a 13. Dimecres de 17 a 18 Miquel Angel Carnicé Torrelles			

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
MARI LOPEZ, ROGER	roger.mari@diei.udl.cat	10,2	Fridays from 17h to 19h at the office 1.11 of the CREA.

## Subject's extra information

The main background needed for the correct follow-up of the course are:

Operations with vectors, trigonometry, derivatives and integrals of one variable, esquematics and graphical representation of solid systems, kinematics and dynamics of rigid body motion in the plane, kinematic and dynamic analysis of mechanisms in movement in the plane.

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

- Linear algebra
- Calculation
- Physics I
- Graphic Expression I
- Theory of Mechanisms

### SECURITY INFORMATION:

It is **COMPULSORY** that the students bring the following elements of individual protection (EPI) to the practices at the laboratory.

- Blue laboratory gown from UdL (unisex)
- Protection glasses
- Mechanical protection gloves

They can be purchased through the shop Údels of the UdL:

C/ Jaume II, 67 baixos  
Centre the Cultures i Cooperació Transfronterera

<http://www.publicacions.udl.cat/>

The use of other elements of protection (for example caps, masks, gloves of chemical orelectricalrisk, etc.) wil depend on the type of practice to be done. In that case, the teacher will inform of the necessity of specific EPI.

Not bringing the EPI's described or not fulfilling the norms of general security that are detailed below imply that the student can not access to the laboratories or have to go out of them. The no realisation of the practices for this reason imply the **consequences in the evaluation** of the subject that are described in this course guide.

### **GENERAL NORMS OF SECURITY IN LABORATORY PRACTICES**

- Keep the place of realisation of the practices clean and tidy. The table of work has to be free from backpacks, folders, coats...
- No short trousers or shorts kirts are allowed in the laboratory.
- Closed and covered footwear is compulsory in the laboratory.
- Long hair needs to be tied.
- Keep the laboratoy gown laced in order to be protected from spills of chemicals.
- Bangles, pendants or widesleeves are not allowed as they can be trapped.
- Avoid the use of contactlenses, since the effect of the chemical products is much bigger if they enter between the contact lense and the cornea. Protection over-glasses can be purchased.
- No food or drink is allowed in the laboratory.
- It is forbidden to smoke in the laboratories.

- Wash your hands when ever you have contact with a chemical product and before going out of the laboratory.
- Follow the instructions of the teacher and of the laboratory technicians and ask for any doubt on security.

For further information, you can check the following document of the *Servei de Prevenció de Riscos Laborals de la UdL*: <http://www.sprl.udl.cat/alumnes/index.html>

## Learning objectives

- Do a the design of a mechanism in a kinematic level, from the specifications of positions of one of its members
- Do the kinematic analyse of mechanisms that incorporate flat cams
- Do the kinematicand the dynamic analyse of transmissions for gears
- Study the systems of transmission in machines to level of drive and of regularity of operation
- Study of a simple vibratory systems of a degree of freedom.

## Competences

### Cross-disciplinary competences

**EPS1.** Capacity to solve problems and prepare and defence arguments inside the area of studies.

**EPS6.** Capacity of analysis and synthesis.

### Specific competences

**GEM20.** Knowledgeandcapacity for thecalculation, designandtesting of machines.

## Subject contents

1. GRAPHIC SYNTHESIS OF MECHANISMS
2. CAMS
3. GEARS
4. DYNAMICS OF MACHINES WITH A DEGREE DELLIBERTAT
5. INTRODUCTION TO THE VIBRATIONS OF A DEGREE OF FREEDOM

## 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. 1 practice about graphical synthesis of mechanisms using CAD and 1 practice at the Mechanics laboratory, analysing and measuring cams and gears.
- **Work in group:** Development of 1 work about the dynamic analysis of a cyclic machine that must be done during the course.

## 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 2: Theory Unit 2: 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 3: Theory Unit 3: Problems	2 2	4
8	Lectures Practice	Unit 3: Theory Practice 2	2 1	6
9	Evaluation	Exam 1	2	5
10	Lectures Problems	Unit 4: Theory Unit 4: Problems	2 2	6
11	Lectures Problems	Unit 4: Theory Unit 4: Problems	2 2	6
12	Lectures Work in group	Unit 4: Theory Work in group treatment	2 2	8
13	Lectures Problems	Unit 5: Theory Unit 5: Problems	2 2	6
14	Lectures Problems	Unit 5: Theory Unit 5: Problems	2 2	6
15	Lectures Problems	Unit 5: Theory Unit 5: Problems	2 2	6
16-17	Evaluation	Exam 2	2	7
18	Tutoring	Tutoring	2	4
19	Evaluation	Recovery exam	2	4

## Evaluation

Some evaluations activities will be carried out:

- 1st individual written test at middle quarter (week 9). It will evaluate what has been worked in class and worked in practice to date of the 1st test. The test will consist of a part of test questions multiple choice and some problems to develop.
- Practices that are compulsory will be evaluated from the report the corresponding group performed.
- A work in group will be proposed, which must be submitted within the deadline to be evaluated.
- 2nd written test at the end of the quarter (17 or 18 days). It will evaluate what has been worked in class and worked in practice between the dates of 1st and 2nd test. The test will consist of a part of test questions multiple choice and some problems to develop.
- In order to pass the course, your weighted note of the written tests, according to the relative weight of each of them, must be equal to or greater than 3.5. In the case of not achieving the minimum grade, students must attend the remedial test.

- Remedial test (week 20) to ??evaluated the topics presented in class and worked throughout the course. The test will consist of a part of test questions multiple choice and some problems to develop. If the student attends this test, the grade replaces the notes of the two previous written tests, whether it is higher or if it is lower. A minimum mark of 3.5 is establishe for this test in order to pass the course.

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

Activity	Weight
1st written test	30
Pràctice	10
Work in groups	20
2nd written test	40
Remedial test	70

*Note: If not reached the minimum score of 3.5 on written tests, the mark will be the minimum between the result of the average percentage, according to the table above, and 3.5.*

*Note: Practice grades and group work are not recoverable.*

## Bibliography

Course notes: "Teoria de Màquines".

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.

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

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