Last update: 23-04-2019

320010 - SM - Mechanical Systems

Coordinating unit: 205 - ESEIAAT - Terrassa School of Industrial, Aerospace and Audiovisual Engineering

Teaching unit: 712 - EM - Department of Mechanical Engineering

Academic year: 2019

Degree: BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN TEXTILE TECHNOLOGY AND DESIGN ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)

ECTS credits: 6 Teaching languages: Catalan

Teaching staff

Coordinator: Pàmies Gómez, Teresa

Others: Balastegui Manso, Andreu
Marañón Martínez, Ana
Ripoll Garcia, Ruben
Ciscar Adalid, Maria

Opening hours

Timetable: To be agreed

Prior skills

Students will be expected to be fully proficient in statics as taught in Physics.

Degree competences to which the subject contributes

Specific:

4. IND_COMMON: Understanding of and ability to use the principles of strength of materials.

5. IND_COMMON: Understanding of the principles of the theory of machines and mechanisms.

Transversal:

1. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 2. Using strategies for preparing and giving oral presentations. Writing texts and documents whose content is coherent, well structured and free of spelling and grammatical errors.

Last update: 23-04-2019

320010 - SM - Mechanical Systems

Teaching methodology

- Face-to-face lectures and problem solving sessions.
- Independent learning and exercises.
- Preparation and completion of group activities subject to assessment.

In the lectures, the lecturer will introduce the theoretical fundamentals of the subject, concepts, methods and results, which will be illustrated with relevant examples to facilitate their understanding.
Students will be expected to study in their own time so that they are familiar with concepts and are able to solve the exercises set.
Tools found on the ATENEA platform will be used to foster collaborative learning.
The transversal piece of work on the course will concentrate on the study of an object, machine or real mechanism. It will be completed outside of class time in groups.

Learning objectives of the subject

Provide students with the knowledge that will enable them to determine the parameters characteristic of a mechanical system.
Examine the elements characteristic of power systems, for subsequent use in statics and dynamics.
Model applied force, bonding and friction actions so that diagrams of the free system can be plotted.
Understand the kinematics and dynamics of simple mechanisms and the basic concepts behind them.
The ultimate aim of the above set of skills is to apply them to the static study of various systems: particles, rigid bodies, trusses and cables. It is essential to acquire these skills as they will subsequently be used in many applications.

Study load

Total learning time: 150h	Hours large group:	30h	20.00%
	Hours medium group:	30h	20.00%
	Hours small group:	0h	0.00%
	Guided activities:	0h	0.00%
	Self study:	90h	60.00%

Last update: 23-04-2019

320010 - SM - Mechanical Systems

Content

TOPIC 1: INTRODUCTION

Learning time: 4h

Theory classes: 2h
Self study : 2h

Description:
1.1. Fundamental concepts
1.2. Newton's laws
1.3. Vector study
1.4. Statics of particles

Specific objectives:
- Introduction to the subject, learning objectives, syllabus, coursework, assessment system and reading list.
- Introduction of the basic concepts of mechanics.
- Overview of all the vector concepts required to follow the subject.

TOPIC 2: STATICS OF RIGID BODIES

Learning time: 38h

Theory classes: 5h 30m
Practical classes: 7h 30m
Self study : 25h

Description:
2.1. Equilibrium in two dimensions
2.2. Reactions
2.3. Internal forces

Related activities:
AV1, AV3

Specific objectives:
- Study of the conditions of equilibrium of a system of rigid bodies.
- Type of forces applied.
- Determination of bonding actions.
- Plotting of diagrams of free solids.
- Study of the internal forces that hold solids together.

Last update: 23-04-2019

320010 - SM - Mechanical Systems

TOPIC 3: BEAMS	Learning time: 31h 30m Theory classes: 6h Practical classes: 7h 30m Self study : 18h

Description:
3.1. Internal forces
3.2. Beams with concentrated loads
3.3. Beams with distributed loads

Related activities:
AV1, AV4

Specific objectives:
- Study of the internal forces that support beams.
- Plotting of diagrams of the bending moment and shear stress.

TOPIC 4: TRUSSES	Learning time: 13h Theory classes: 2h Practical classes: 2h Self study : 9h

Description:
4.1. Types of truss
4.2. Statics study of anchors
4.3. Knot theory
4.4. Method of sections

Related activities:
AV2

Specific objectives:
- Study of forces that hold each part of a truss together.
- Application of various calculus methods.

Last update: 23-04-2019

320010 - SM - Mechanical Systems

TOPIC 5: CABLES

Learning time: 16h 30m

Theory classes: 3h 30m
Practical classes: 5h
Self study : 8h

Description:
5.1. Cables with concentrated loads
5.2. Cables with distributed loads
5.3. The catenary

Related activities:
AV1, AV5

Specific objectives:
- Study of tension supported by cables.

TOPIC 6: KINEMATICS AND MECHANISM DYNAMICS

Learning time: 41h

Theory classes: 9h
Practical classes: 8h
Self study : 24h

Description:
6.1. Introduction
6.2. Plane kinematics
6.3. Plane dynamics

Related activities:
AV1, AV5

Specific objectives:
- Definitions of the basic components that make up a mechanism.
- Methodology for calculating velocity and acceleration.
- Introduction to dynamics.
- Transfer of movement

320010 - SM - Mechanical Systems

TOPIC 7:ANALYSIS OF SYSTEMS INVOLVING DRY FRICTION	Learning time: 6h Theory classes: 2h Self study : 4h

Description:
7.1. Laws of friction
7.2. Diverse applications

Related activities:
AV1

Specific objectives:
- Study of forces that hold each part of a truss together.
- Application of various calculus methods.

Last update: 23-04-2019

320010 - SM - Mechanical Systems

Planning of activities

AV1	Hours: 4h Practical classes: 4h

Description:
Resolution of an exercise proposed by the teacher, on a group work based, during the class.

Support materials:
Class notes, theory's slides and the wording of the exercise.

Descriptions of the assignments due and their relation to the assessment:
The averaged mark of all the exercises doned during the course corresponds with a 10% of other deliveries assessment.

Specific objectives:
The estudiante has to be able to apply and consolidate the theoretical knowledge achieved on the subject. And also must be able to analise the problem and design the plan for the resolution with the established time.

AV2	Hours: 5h Self study: 5h

Description:
Solve a case proposed by the teacher, develope it in a written format and do the oral exposition.

Support materials:
Bibliographical resources of the subject, class notes, rubric of the efficient oral and written communication.

Descriptions of the assignments due and their relation to the assessment:
The assessment of written and the oral work corresponds to a 10% in the qualification of the other deliveries.

Specific objectives:
That the student learn to use strategies for preparing and giving oral presentations, writing texts and documents whose content is coherent, well structured and free of spelling and grammatical errors. Participate on working in a team and making positive contributions once the aims and group and individual responsibilities have been defined. Reaching joint decisions on the strategy to be followed.

AV3	Hours: 1h 30m Theory classes: 1h 30m

Description:
Development of the first examination of the subject.

Support materials:
The wording to be solved and a formulary indicated by the teacher.

Descriptions of the assignments due and their relation to the assessment:
This activity is evaluated as oral and written tests of the global mark of the subject.

Specific objectives:
Develope theoretical and practice classroom knowledge and show the level achieved. And also must be able to analise the problem and design the plan for the resolution with the established time.

320010 - SM - Mechanical Systems

AV 4	Hours: 1h 30m Theory classes: 1h 30m

Description:
Development of the second examination of the subject.

Support materials:
The wording to be solved and a formulary indicated by the teacher.

Descriptions of the assignments due and their relation to the assessment:
This activity is evaluated as oral and written tests of the global mark of the subject.

Specific objectives:
Develope theoretical and practice classroom knowledge and show the level achieved. And also must be able to analise the problem and design the plan for the
resolution with the established time.

AV5	Hours: 2h Theory classes: 2h

Description:
Development of the third examination of the subject.

Support materials:
The wording to be solved and a formulary indicated by the teacher.

Descriptions of the assignments due and their relation to the assessment:
This activity is evaluated as the item oral and written tests of the global mark of the subject.

Specific objectives:
Develope theoretical and practice classroom knowledge and show the level achieved. And also must be able to analise the problem and design the plan for the
resolution with the established time.

Qualification system

- Oral and written tests 80% (25% first exam, 25% second exam, 30% third exam)
- Other deliveries 20%
- Cross Competence (effective oral and written communication) embedded in the section on other deliveries.

For those students who meet the requirements and submit to the reevaluation examination, the grade of the reevaluation exam will replace the grades of all the on-site written evaluation acts (tests, midterm and final exams) and the grades obtained during the course for lab practices, works, projects and presentations will be kept.
If the final grade after reevaluation is lower than 5.0, it will replace the initial one only if it is higher. If the final grade after reevaluation is greater or equal to 5.0, the final grade of the subject will be pass 5.0.

320010 - SM - Mechanical Systems

Regulations for carrying out activities

Is essential to rate at other deliveries, to be present the date and time of the realization of the activity at the enrolled class.
The realization of the exams is without class notes.
The first two examinations will be made compulsorily with a non graphical calculator.

Bibliography

Basic:

Hibbeler, R. C. Mecánica vectorial para ingenieros: estática. 10a ed. México: Pearson Educación, 2004. ISBN 9702605016.

Meriam, J. L. Mecánica para ingenieros. Vol. 2, Dinámica. 3a ed. Barcelona: Reverté, 1998. ISBN 8429142592.

Beer, Ferdinand Pierre [et al.]. Mecánica vectorial para ingenieros, vol. 1, estática [on line]. 10ª ed. México [etc.]: McGraw-Hill, cop. 2013 [Consultation: 04/10/2018]. Available on: <http://www.ingebook.com/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=4260>. ISBN 9786071509253.

Complementary:

Meriam, J. L. Mecánica para ingenieros. Vol. 1, Estática. 3a ed. Barcelona: Reverté, 2004. ISBN 8429142576.

Shigley, Joseph Edward. Teoría de máquinas y mecanismos. México: McGraw-Hill, 1982. ISBN 968451297X.

Others resources:

Theory slides and problems collection puts on Atenea.