Last update: 23-04-2019

220051 - Mechanics II

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 AEROSPACE TECHNOLOGY ENGINEERING (Syllabus 2010). (Teaching unit Compulsory)

ECTS credits: 6 Teaching languages: Catalan, Spanish, English

Teaching staff

Coordinator: Romeu Garbi, Jordi
Arcos Villamarín, Robert

Others: Noori, Behshad

Prior skills

To properly tackle the present subject, the student should have a solid basis on Newtonian mechanics (statics, kinematics and dynamics) and on the obtention of the independent degrees of freedom of a mechanical system.

Requirements

Regarding to the experimental laboratory sessions, which are face-to-face sessions, the attendance is mandatory for the students.

Degree competences to which the subject contributes

Specific:

CE20. GrETA/GrEVA - Adapted and applied to engineering knowledge: fracture mechanics and continuum approaches dynamic fatigue of structural instability and aeroelasticity.

Teaching methodology

The subject is structured in:
- Large group sessions in which the case to be solved is exposed, the theory that rules the phenomena and the solving resolution.
- Small group sessions linked with the laboratory: Sessions of experimental laboratory, where students work with real cases with the finality of releasing the most common measure processes and showing the theoretical concepts of the big group lessons.
- Small group sessions linked with the non-classroom laboratory sessions: numerical models able to represent and simulate real problems will be studied.

Learning objectives of the subject

- To have a good command of the determination of the equation of motion of a mechanical system and know the analytical methods that allow this obtention.
- To be able to understand the vibratory behaviour of a mechanical system in the free case and subjected to diferents kinds of excitation and, furthermore, know the mathematical expressions and the calculation procedures that allow to address a problem like this.
- To know the experimental techniques used to measure the mechanical vibration in structures and how to use this experimental data to dynamically characterise the particular mechanical system.
- To know the passive control techniques that allow to control the dynamic behaviour of a particular mechanical system.

Last update: 23-04-2019

220051 - Mechanics II

Study load

Total learning time: 150h	Hours large group:	46h	30.67%
	Hours small group:	14h	9.33%
	Self study:	90h	60.00%

Content

Module 1: Virtual work method.

Learning time: 22h

Theory classes: 7h
Self study : 15h

Description:

Module 2: Lagrange equations.

Learning time: 20h

Theory classes: 5h
Self study : 15h

Description:

Module 3: Vibrations of one-degree-of-freedom systems

Learning time: 49h

Theory classes: 16h
Laboratory classes: 8h
Self study : 25h

Description:

Module 4: Vibrations of N-degrees-of-freedom systems

Learning time: 59h

Theory classes: 18h
Laboratory classes: 6h
Self study : 35h

Description:

Last update: 23-04-2019

220051 - Mechanics II

Planning of activities

LARGE GROUP	Hours: 63h Theory classes: 42h Self study: 21h
SMALL GROUP	Hours: 28h Laboratory classes: 14h Self study: 14h
MIDTERM EXAM	Hours: 19h 20m Theory classes: 1h Self study: 18h 20m
FINAL EXAM	Hours: 30h 50m Theory classes: 2h 20m Self study: 28h 30m
EXAM OF LABORATORY SESSIONS	Hours: 8h 50m Theory classes: 0h 40m Self study: 8h 10m

Qualification system

The final mark of the subject can be computed from the following expression: 0,2*MA+0,1*VA + 0,175*Lab + 0,175*ELab + 0,35*EF
MA: Analytical Mechanics exam
VA: Analytical Vibrations exam
EF: Final exam (Numerical vibrations)
Lab: Reports from the Laboratory sessions.
ELab: Laboratory sessions Exam.

If mark (EF) > mark (VA) then mark (VA) rises to mark (EF)

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.

220051 - Mechanics II

Regulations for carrying out activities

All the exams must be solved individually. The use of any complemetary material in the exam is permitted. In contrast, it is forbidden the use of mobile phones, smartphones or any other system that enables the communication between students.
Regarding to the reports from the laboratory sessions, each group must present a unique report for each lab sessions, always written in the basis of the specific writing regulations for technical reports that will be provided when the course begins.

Bibliography

Basic:

Ginsberg, Jerry H. Advanced engineering dynamics. 2nd ed. Cambridge, US: Cambridge University Press, 1995. ISBN 0521470218.

Agulló i Batlle, J. Introducció a la mecánica analítica, percussiva i vibratòria. Barcelona: OK Punt, 1998. ISBN 8492085037.

Thomson, William T. Theory of vibration with applications. 4th ed. Cheltenham: Nelson Thornes, cop. 1993. ISBN 0748743804.

Géradin, Michel [et al.]. Mechanical vibrations: theory and application to structural dynamics. 2nd ed. Chichester [etc.]: Wiley [etc.], cop. 1997. ISBN 0471975249.

Tongue, Benson H. Principles of vibration. 2nd ed. New York [etc.]: Oxford University Press, cop. 2002. ISBN 0195142462.

Den Hartog, J. P. Mechanical vibrations. New York: Dover Publications, 1984. ISBN 0486647854.

Complementary:

Inman, Daniel J. Engineering vibration. 4th ed. Upper Saddle River, N.J: Prentice Hall, 2014. ISBN 9780273768449.

Petyt, Maurice. Introduction to finite element vibration analysis. Cambridge [England]: Cambridge University Press, 1990. ISBN 0521266076.