



Course guide

330513 - ME - Mathematics for Engineering

Last modified: 19/05/2023

Unit in charge: Manresa School of Engineering
Teaching unit: 749 - MAT - Department of Mathematics.

Degree: BACHELOR'S DEGREE IN AUTOMOTIVE ENGINEERING (Syllabus 2017). (Compulsory subject).

Academic year: 2023 **ECTS Credits:** 4.5 **Languages:** Catalan, English

LECTURER

Coordinating lecturer: Cors Iglesias, Josep M.
Domenech Blásquez, Margarita

Others:

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

CE1. Ability to solve mathematical problems that may arise in engineering. Ability to apply knowledge about: linear algebra; geometry; differential geometry; differential and integral calculus; differential equations and partial derivatives; numerical methods; numerical algorithms; statistics and optimization.

Generical:

CG3. Knowledge of basic and technological subjects that will enable students to learn new methods and theories and that will endow them with the versatility needed to adapt to new situations.

Transversal:

2. 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.
3. THIRD LANGUAGE. Learning a third language, preferably English, to a degree of oral and written fluency that fits in with the future needs of the graduates of each course.

Basic:

CB1. Students will be able to demonstrate their knowledge of a field of study that builds on secondary education and is usually found at a level that, while supported by advanced textbooks, also includes aspects that involve knowledge of the latest developments in the field of study.

CB2. Students will be able to apply their knowledge to their work or vocation in a professional manner and demonstrate that they possess the competencies that are typically demonstrated by elaborating and defending arguments and solving problems in the field of study.

TEACHING METHODOLOGY

- MD1 Master class or conference (EXP)
- MD2 Problem solving (PR)
- MD5 Project or activity (PR)
- MD7 Assessment activities (EV)

LEARNING OBJECTIVES OF THE SUBJECT

Learning the basic concepts of differential equations, in order to develop analytical skills and logical thinking, increasing the ability to abstract and generalize. Apply knowledge to solve problems, establishing methods and algorithms for solving them. Obtain and interpret results with computer tools.



STUDY LOAD

Type	Hours	Percentage
Hours small group	22,5	20.00
Self study	67,5	60.00
Hours large group	22,5	20.00

Total learning time: 112.5 h

CONTENTS

Content title 1: Ordinary Differential Equations

Description:

Initial-value and boundary-value problems. Linear and nonlinear Systems. Forcing and resonance. Laplace transforms. Numerical solutions.

Specific objectives:

Ability to solve initial value and boundary value problems of ordinary differential equations.

Related activities:

1,2,3,4

Full-or-part-time: 82h 30m

Theory classes: 16h 30m

Laboratory classes: 16h 30m

Self study : 49h 30m

Content title 1: Partial Differential Equations

Description:

Partial differential equations separable. Laplace, wave and heat conduction equations. Numerical solutions.

Specific objectives:

Ability to solve problems with boundary conditions of differential equations in stationary dimensional one partial derivatives.

Related activities:

1,2,3,4

Full-or-part-time: 30h

Theory classes: 6h

Laboratory classes: 6h

Self study : 18h



ACTIVITIES

Title of activity 1: Theoretical classes

Description:

Presentation of the theoretical part and its applications.

Specific objectives:

Those corresponding to the contents 1,2.

Material:

Digital campus documents and basic bibliography.

Full-or-part-time: 36h

Theory classes: 18h

Self study: 18h

Title of activity 2: Classes of problems

Description:

Approach and problem solving.

Specific objectives:

Those corresponding to the contents 1,2.

Material:

Exercise statements on the digital campus and basic bibliography.

Full-or-part-time: 42h 30m

Laboratory classes: 16h 30m

Self study: 26h

Title of activity 3: Laboratory classes

Description:

Implementation of theoretical results. Numerical and symbolic manipulation.

Specific objectives:

Those corresponding to the contents 1,2.

Material:

Scripts on the digital campus.

Full-or-part-time: 17h 30m

Laboratory classes: 6h

Self study: 11h 30m



Title of activity 4: Written tests

Description:

Three partial control tests: EP1, EP2 and EP3.

Specific objectives:

Those corresponding to the contents 1,2.

Material:

Test statements.

Delivery:

Individual answers.

Full-or-part-time: 16h 30m

Theory classes: 4h 30m

Self study: 12h

GRADING SYSTEM

Grade will be calculated from the following expression:

$$NC=0.35*EP1+0.35*EP2+0.30*EP3$$

where EP1, EP2 and EP3 are the grades of the partial exams.

Final grade of the course will be calculated from the following expression

$$NF = \max \{NEF, NC\}$$

where NEF is the grade of the final exam

EXAMINATION RULES.

An unperformed activity carries a grade of zero in that activity.

BIBLIOGRAPHY

Basic:

- Blanchard, P.; Devaney, R. L.; Hall, G. R. Differential equations. 4th ed., International ed. Belmont: Brooks/Cole, 2011. ISBN 9781133110590.

- Zill, Dennis G. Ecuaciones diferenciales con problemas de valores en la frontera. 9ª ed. Cuajimalpa, Ciudad de México: Cengage, 2018. ISBN 9786075266305.

RESOURCES

Other resources:

Notes and / or slides related to the theoretical and practical classes.

List of problems.