

Course guide

220093 - ED - Differential Equations

Last modified: 19/04/2023

Unit in charge: Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 749 - MAT - Department of Mathematics.

Degree: BACHELOR'S DEGREE IN INDUSTRIAL TECHNOLOGY ENGINEERING (Syllabus 2010). (Compulsory subject).

Academic year: 2023 **ECTS Credits:** 6.0 **Languages:** Catalan

LECTURER

Coordinating lecturer: MARI CARMÉ LESEDUARTE MILAN

Others: RAMON QUINTANILLA DE LATORRE

PRIOR SKILLS

The study of this subject requires a good knowledge of the subjects Calculus I, Linear Algebra and Calculus II.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

CE01-INDUS. Ability to solve mathematical problems that may arise in engineering. Aptitude to apply knowledge of linear algebra; geometry; differential geometry; differential and integral calculus; differential and partial differential equations; numerical methods; numerical algorithms; statistics and optimization. (Basic training module)

TEACHING METHODOLOGY

Presencial sessions of content exhibition.

Presencial sessions of practical work (exercises).

Autonomous work of study and realization of exercises.

It will be introduced concepts and fundamental results of each subject, as well as examples and cases in the theory sessions. In the practical sessions and also in an autonomous way, students will have to solve exercises and problems which help them to understand the studied concepts and to acquire the skill of expressing oneself correctly, using the notions and tools of the course.

Each teacher has some consultation hours where the students can solve the doubts related with theory and the problems.

LEARNING OBJECTIVES OF THE SUBJECT

A. Learning to solve differential equations ordinary and partial derivatives

B. Solving engineering problems through the utilization the methods of the corresponding phenomena.

STUDY LOAD

Type	Hours	Percentage
Hours medium group	28,0	18.67
Hours large group	32,0	21.33
Self study	90,0	60.00

Total learning time: 150 h



CONTENTS

EDO's generalities

Full-or-part-time: 12h 30m

Theory classes: 3h

Practical classes: 2h

Self study : 7h 30m

First order equations

Specific objectives:

Full-or-part-time: 30h

Theory classes: 7h

Practical classes: 5h

Self study : 18h

Applications

Description:

(ENG) Mostrar als estudiants diversos problemes de la mecànica i l'enginyeria que poden ser estudiats i modelats amb l'ajuda de les equacions diferencials.

Specific objectives:

(ENG) Els estudiants hauran de saber resoldre problemes de creixement de poblacions, desintegració de substàncies, buidat de dipòsits, escalfament i refredament, mescles, vibracions, circuits elèctrics...

Full-or-part-time: 10h

Theory classes: 2h

Practical classes: 2h

Self study : 6h

Linear equations of n order

Specific objectives:

Full-or-part-time: 35h

Theory classes: 7h

Practical classes: 7h

Self study : 21h

Laplace transform

Specific objectives:

Full-or-part-time: 30h

Theory classes: 6h

Practical classes: 6h

Self study : 18h



Basic elements of equations in partial derivatives

Description:

Full-or-part-time: 32h 30m

Theory classes: 7h

Practical classes: 6h

Self study : 19h 30m

ACTIVITIES

PARTIAL EXAM

Description:

Full-or-part-time: 12h

Theory classes: 2h

Self study: 10h

FINAL EXAM

Description:

Full-or-part-time: 12h

Theory classes: 2h

Self study: 10h

THEORY / LARGE GROUP SESSIONS

Full-or-part-time: 56h

Theory classes: 26h

Self study: 30h

EXERCISES / MEDIUM GROUP SESSIONS

Full-or-part-time: 62h

Practical classes: 28h

Self study: 34h

CONTROL 1

Full-or-part-time: 4h

Theory classes: 1h

Self study: 3h



CONTROL 2

Full-or-part-time: 4h

Theory classes: 1h

Self study: 3h

GRADING SYSTEM

The final qualification of the subject will be obtained from the four following marks:

Partial Examination: 30%

Final Examination: 50%

Control 1: 10%

Control 2: 10 %

The partial and final examinations consist on one part with questions about concepts associated with the objectives of subject and some exercises of application. Mechanisms to recover the partial examination will be established.

The partial and final examinations will be performed in the schedules and classrooms foreseen by the School, controls 1 and 2 will be performed in hours of class.

Unsatisfactory results of the partial exam may be re-conducted by a written test to be carried out on the day of the final exam. Students with a score of less than 5 in the partial exam can be admitted to this test. If the grade of this test is equal to or higher than 5, then the grade of the partial exam will be replaced by a 5.

EXAMINATION RULES.

The examinations and the controls have to be performed in an individual way. The teachers staff can request the identification of students.

BIBLIOGRAPHY

Basic:

- Simmons, George Finlay. Ecuaciones diferenciales: teoría, técnica y práctica [on line]. Mèxic: McGraw-Hill, 2007 [Consultation: 17/06/2022]. Available on:

https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=4312. ISBN 9780072863154.

- Boyce, William E. Introducción a las ecuaciones diferenciales. México: Limusa, 1972. ISBN 9681806360.

- Zill, Dennis G. Ecuaciones diferenciales con aplicaciones de modelado. 9a ed. México: International Thomson, 2009. ISBN 9789708300551.

- Leseduarte Milán, M.C.[et al.]. Equacions diferencials: problemes resolts [on line]. Barcelona: Iniciativa Digital Politècnica, 2012 [Consultation: 14/05/2020]. Available on: <http://hdl.handle.net/2099.3/36607>. ISBN 9788476539330.