Faculty: Science and Technology

Course: PDE, Numerical simulation and Fourier analysis

Programme: Study Abroad in Engineering

Semester: 2 – Spring

ECTS credits: 9

Duration: 67,5 hours

Language of instruction: English

Instructor: Rafel Martí Serra

Course Description:

The main objective of the module is to introduce the fundamental tools of analysis of deterministic and random applied mathematics, in order to prepare engineering students to continue their studies in good conditions in their specialisation (financial engineering, actuarial sciences, numerical mechanics, etc.) or pathway (possibly "applied mathematics", research, etc.).

Indeed, the mathematical models used in physics, chemistry and medical biology, not to mention finance and insurance, very often require advanced knowledge of mathematics. At the end of this course, students are expected to be able to master concepts of Fourier analysis, of partial derivative equations, and to be able to simulate situations in their different professional fields.

Prerequisites:

Basics knowledge in physics and mathematics equations

Attendance policy

Attendance is mandatory for all classes, including study visits. Any exams, tests, presentations, or other work missed due to student absences can only be rescheduled in cases of certified medical or family emergencies.

Learning outcomes

By the end of the course, students should be able to use of Matlab and his application to create a simple application of numerical simulation.

Method of presentation

- Lectures and discussions: Lectures with appropriate visual support provide the theoretical content of the sessions. Class discussions facilitate the students' ability to connect reading and lectures, analysing or applying concepts.

- Class participation: Students are expected to participate in group activities and in the discussions based on the course readings and cases proposed.
- Home exercises: Students are expected to solve several exercises during the semester.

Required work and assessment methods

Cases, reading and exercises. Preparation, development and discussions related to exercises will be highly valuable for the success of the course both at individual and group level.

Validation exam. Individual test

Contents

Part One: Matlab

In this part of the course, the student will be learn how the MATLAB program works and its different tools to create the simulations: Basic elements, graphics, programming, …

Part Two: Fourier Analysis

In this part, the student will learn the basic concepts and techniques of the Fourier transform in order to be able to use it as a mathematical tool.

Part Three: Partial derivatives equations (PDE)

In this part, the students will learn different tools to solve the any partial derivatives equations and tools to solve it numerically. Also, they will study the

Activities weight. Ordinary evaluation.

In each of the parts, the student will have to carry out exercises and/or exams that will be weighted according to the teacher's indications.

At the end of the course, the final grade will be the average of the three parts.

Retake exams and activities.

Students who do not pass the course must complete the tasks assigned by the teacher for the part of the course they have not passed. If the student passes, the grade for this part of the course will be 5.

Recommended reading

BASIC

COMPLEMENTARY

Sites:

(more to be added during the course)