DMA-SAP-230 INTRODUCTION TO DIFFERENTIAL EQUATIONS

SEMESTER: Spring
CREDITS: 6 ECTS (4 hrs. per week)
LANGUAGE: English
DEGREES: SAPIENS program

Course overview
Techniques and applications of ordinary differential equations, including Fourier series and boundary value problems, linear systems of differential equations and an introduction to partial differential equations. Intended for engineering majors and other who require a working knowledge of differential equations.

The aim of this course is to provide you with:

- techniques, both explicit and numerical, to solve important classes of ordinary differential equations;
- practice in understanding how differential equations model physical phenomena;
- the ability to interpret the solutions that are found.

Prerequisites
Basic knowledge of calculus and linear algebra.

Course contents and methodology

Methodology
Lecture, solving calculation problems during exercises.

Contents

I. INTRODUCTION TO DIFFERENTIAL EQUATIONS (Chapter 1 of [1])

Basic definitions and terminology. Initial value problems. Differential equations as mathematical models: population dynamics, radioactive decay, Newton’s law of cooling, spread of a disease, chemical reactions, falling bodies and air resistance, etc.
II. FIRST-ORDER DIFFERENTIAL EQUATIONS (Sections 2.1-2.4, 3.1-3.2, 9.1-9.2 of [1])


III. SYSTEMS OF LINEAR FIRST-ORDER DIFFERENTIAL EQUATIONS (Chapter 8 and Section 3.3 of [1])


IV. HIGH-ORDER LINEAR DIFFERENTIAL EQUATIONS (Sections 4.1-4.7 and 5.1 of [1])


V. PARTIAL DIFFERENTIAL EQUATIONS (Sections 11.1-11.4, 12.1-12.7 of [1])


Textbooks

Grading

The overall grade will be obtained as follows:

- Final examination (40%)
- Two midterms (25% each)
- Homework (10%)

The exams are all closed notebook, closed textbook and no calculator. The course will not be graded on a curve, i.e., there is no bound on the numbers A’s, B’s, C’s, etc.