

32102 - Differential equations

Syllabus Information

Academic year: 2024/25

Subject: 32102 - Differential equations

Faculty / School: 110 - Escuela de Ingeniería y Arquitectura

Degree: 653 -

ECTS: 6.0

Year: 1

Semester: Second semester

Subject type: Basic Education

Module:

1. General information

The purpose of this subject is for students to acquire a solid foundation in the fundamentals of **Differential Equations**, providing them with the appropriate methods for their resolution, both exact and numerical; learn to solve a problem in a rigorous way, selecting the most efficient techniques and strategies; and to be able to use a mathematical software for its solution.

It is recommended that the student possesses the knowledge acquired in the subjects of Calculus and Algebra: differential and integral calculus, linear algebra, as well as the numerical methods characteristic of these topics.

The assessable contents do not provide direct capabilities for the achievement of the 2030 Agenda; however, they are essential to base subsequent knowledge that is related to the SDGs.

2. Learning results

- Know the fundamentals of ordinary differential equations and partial differential equations. Numerical methods and numerical algorithms of application in the solution of mathematical problems in the field of Biomedical Engineering.
- Solve mathematical problems with differential equations that may arise in the field of Biomedical Engineering.
- Apply numerical methods in the resolution of the corresponding mathematical problems.
- Use symbolic and numerical calculation tools in a reflexive way.
- Handle mathematical language proficiently, in particular the symbolic and formal language.
- Possess scientific-mathematical thinking skills that allow them to ask and answer certain mathematical questions.

3. Syllabus

The subject will address the following topics:

- Ordinary and partial differential equations.
- Differential systems.
- Transform methods.
- Runge-Kutta and finite difference methods.

4. Academic activities

Theory lessons (40 h)

Presentation of theoretical contents accompanied by illustrative examples and problem solving.

Problem sessions (8 h)

Problem solving by students organized in subgroups and guided by the teacher.

Computer practices (12 h)

Mathematical algorithms are analyzed and programmed using symbolic and numerical programming software installed in the center's computer laboratories. The chosen software will allow working with symbolic, numerical and graphical calculations, facilitating the understanding of the proposed learning results. Each practicum will consist of an exposition of the contents and the resolution of problems related to them.

Personal study

Assessment tests

5. Assessment system

A global assessment system composed of the following tests is proposed:

- Test on the theoretical and practical contents of the subject. Its score will represent 80% of the final grade of the subject. The exam will be mainly practical, although it may contain theoretical or theoretical-practical questions. It will

be evaluated:

- understanding of the mathematical concepts used to solve the problems,
 - the use of efficient strategies and procedures in their resolution,
 - clear and detailed explanations,
 - the absence of mathematical errors in the solutions,
 - correct use of terminology and notation,
 - organised and clear presentation.
- Test on the topics developed in the practical sessions. Its score will represent 20% of the final grade. Consideration will be given to:
 - knowledge of the mathematical software commands needed to solve the problems,
 - the correct interpretation of the results obtained,
 - the ability to select the most appropriate method,
 - clear and detailed explanations and/or reasoning to the questions asked.

The grade for the first call will be determined by the indicated percentages. In addition to the global assessment system, a continuous evaluation system will also be proposed with tests throughout the semester to facilitate the gradual completion of parts of the course.

The assessment in the second call will be carried out by means of a global test similar to the exam mentioned above.

6. Sustainable Development Goals

4 - Quality Education