

ENGR202 Modeling Sustainable Systems

An introduction to differential equations and numerical methods

Course units: Lecture (4) Lab (2)

Course description:

This course is an introductory course in systems modeling through differential equations and numerical methods. The objective of the course is to teach you the mathematics of dynamic systems that follow first and second order differential equations, and through that, we will be able to study a variety of different systems, natural and engineered, from the common lens of systems science. Throughout the course, you will gain experience in mathematical modeling of systems of varying complexities, and you will use your mathematics and programming skills to predict the behavior of these systems. The course combines theoretical work, programming and use of software, and conceptual big-picture thinking about how systems work and how we can improve them.

Course learning outcomes:

This course will teach students to formulate qualitative and quantitative representations of engineered and non-engineered systems, as well as understand and implement the mathematics describing these systems. These CLOs are addressing PLO1 and ABET SO1. After the successful completion of the course, the students will be able to:

1. Demonstrate working knowledge of mathematical modeling applications and usage in engineering
2. Identify methods for the solution of first and second order ordinary differential equations.
3. Predict and modify the behavior of simple systems through programming and computations.
4. Communicate the behavior of a dynamic system graphically and in written form.
5. Explain the behavior of dynamic systems using system thinking principles and terminology.

Course textbook:

Differential Equations and Boundary Value Problems

Computing and Modeling

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