DEA-GITI-313 Dynamic Systems

SEMESTER: Fall

CREDITS: 6 ECTS (4 hrs. per week, including Theory + Lab)

LANGUAGE: Spanish

DEGREES: GITI

Course overview

This course is an introduction to Dynamic Systems. Different real-world systems will be modeled: mechanical systems, electric circuits, etc. The transfer function (based on the Laplace transform applied to ODE representing systems) will be used to relate an input to an output of a given system. Time and frequency response of first-and second-order systems will be analyzed.

Prerequisites

Basic knowledge of Physics, Electric Circuits and Mechanics are required for attending this course.

Course contents

Theory:

1. Introduction to Dynamic Systems. Concept of system, signal and model. Model applications. Properties of models and systems. Modeling of Linear-Time-Invariant (LTI) systems.
2. Laplace Transform. Definition of the Laplace Transform, properties and transforms of basic functions. Inverse Laplace Transform. Relationship between poles and time response. Determination of the time response from the differential equation. Classification of time-response terms.
3. Transfer function. Application to the modeling of LTI systems: transfer function. Stability and Routh-Hurwitz criterion. Steady state response of stable systems. Block diagrams.
4. Real-world system modeling. Electric and electronic circuits. Translational and rotational mechanical systems. Thermal systems.
5. First-order systems. Classification of first-order systems. Step response. Frequency response and Bode diagrams. Asymptotic Bode diagram for first-order systems.

This document is a brief outline of the course and does not replace the official program of study

6. Second-order systems. Step response and frequency response. Resonance and cut-off frequency. Asymptotic Bode diagram for higher-order systems.

Laboratory:

P1. Analysis and simulation tools for dynamic systems: Matlab and Simulink.
P2. Design and analysis of second-order filters based on a Sallen-Key circuit.

Textbook

- N. S. Nise. Control Systems Engineering, 6th Edition. John Wiley and Sons. 2011.

Grading

- Exams account for 60% of the final grade (45% corresponding to the final exam and 15% to the mid-term exam. Anyway, a minimum grade of 5 is required on the final exam to pass the course.
- Continuous evaluation quizzes account for 10%.
- Lab accounts for 30% of the grade. A minimum grade of 5 is required to pass the course.

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