UNIVERSITY of NICOSIA

Course Code	Course Title	ECTS Credits
MENG-342	Systems and Control Engineering	6
Department	**Semester**	**Prerequisites**
Engineering	Fall, Spring	MATH-330
Type of Course	**Field**	**Language of Instruction**
Required	Engineering	English
Level of Course	**Year of Study**	**Lecturer(s)**
1st Cycle	3rd or 4th	Dr Eftychios Christoforou
Mode of Delivery	**Work Placement**	**Co-requisites**
Face-to-face	N/A	None

Objectives of the Course:

The main objectives of the course are to:

- Present the modeling of mechanical, electrical and other linear time-invariant (LTI) dynamical systems both in the time domain as well as and in the Laplace domain.
- Provide an understanding of the stability concept, transient and steady-state response of dynamic systems and their impact on performance of electro-mechanical systems.
- Introduce feedback control and provide understanding how feedback impacts transient and steady-state performance.
- Teach how to design feedback control systems to meet given performance specifications. Familiarize with proportional-integral-derivative (PID) control.
- Introduce the frequency response methods to the design of LTI systems and how this approach relates to the transient and steady-state system performance.
- Familiarize with the analytical methods and tools used in control system analysis and design.
- Develop ability to use software tools for the analysis and design of control systems.
- Introduce the state-space representation of LTI systems and the related control system analysis/design methodologies.

Learning Outcomes:

After completion of the course students are expected to:

- Understand the methodology for modeling dynamic systems (electrical, mechanical, etc.)
- Use the transfer function approach to represent linear systems through Laplace transforms.
- Understand state-space models and their relation to frequency domain models.

- Become familiar with the fundamental characteristics and properties of feedback control systems.
- Use the methods of Routh-Hurwitz, root-locus, Bode, and Nyquist in the analysis and design of control systems.
- Be able to use computer software for the analysis and design of control systems.
- Design feedback controllers and compensators to achieve desired performance specifications.

Course Contents:

- Overview and history of feedback (closed-loop) control.
- Modeling of mechanical, electrical, and other dynamic systems.
- Dynamic system response (Laplace transforms, transfer functions, poles/zeros, dynamic response, time-domain specifications, stability).
- Feedback properties and the Proportional-Integral-Derivative controller.
- Root locus analysis and design.
- Frequency response design method using Bode plots and Nyquist plots.
- State-space design methods.

Learning Activities and Teaching Methods:

Lectures, in-class examples and exercises.

Assessment Methods:

Homework, exams, final exam.

Required Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
Gene F. Franklin, J. David Powell, Abbas Emami-Naeini	Feedback Control of Dynamic Systems	Pearson	2014	1292068906

Recommended Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
Katsuhiko Ogata	Modern Control Engineering	Pearson	2008	0137133375
Richard C. Dorf, Robert H. Bishop	Modern Control Systems	Pearson	2013	1292024054