Course Title	**Control Engineering**				
Course Code	**MME 327**				
Course Type	Compulsory				
Level	Undergraduate				
Year / Semester	3rd Year / 6th Semester				
Teacher's Name	Eftychios Christoforou				
ECTS	6	Lectures / week	3+1 hours	Laboratories / week	6 hours total
Course Purpose and Objectives	The purpose of the course is to introduce the fundamental principles of classical feedback control theory for linear-time-invariant (LTI) systems, both in the time domain and the frequency domain. Understand the concept of feedback and how it affects the stability, transient and steady-state response of dynamic systems. Learn how to design controllers to meet a given set of specifications. Understand basic controllers including the proportional-integral-derivative (PID) control. Familiarize with the analytical methods and software tools used in control system analysis and design. Develop relevant problem-solving skills applied to practical engineering problems.				
Learning Outcomes	• Understand the fundamental concepts of feedback control and its modern engineering applications. • Have a sound understanding the classical control theory and ability to exploit knowledge from modeling and response of dynamic systems (Laplace transform, transfer function, block diagram representations) to design and analyze control systems. • Understand the fundamental characteristics and properties of feedback control systems. • Understand the concept of stability and apply the relevant theory, such as the Routh-Hurwitz and Nyquist stability criterions, to the analysis and design of control systems. • Design feedback controllers using the standard root-locus and the frequency response (Bode plot) techniques. • Design basic controllers to achieve desired performance specifications including the proportional-integral-derivative controller. • Use computer software for the analysis and design of control systems.				
Prerequisites	MME 325	Required	None		
Course Content	The course introduces students to feedback control systems and the classical control theory. Topics covered: (a) History of control and modern applications. (b) Use of dynamical system modeling (mathematical models, Laplace transform, transfer function, block diagrams, system response) in the design of control systems. (c) Feedback control setup and characteristics. (d) Time-domain specifications. (e) System stability and the Routh-Hurwitz criterion. (f) Feedback properties and simple controllers including the PID controller. (g) Steady-state analysis, system type and error constants. (g) Root locus analysis and design. (h) Frequency response design and analysis using Bode plots and Nyquist plots.				

	Laboratory Exercises • Rotary flexible joint / flexible link arm control • Linear / rotary servo inverted pendulum control
Teaching Methodology	• 2 weekly lectures • 1 weekly tutorial • Weekly homework problems • Laboratory exercises • During the first week of the semester the students receive the course syllabus, which includes the course content, bibliography, learning outcomes, assessment and office hours.
Bibliography	• Franklin, G.F., J.D. Powell and A. Emami-Naeini, *Feedback Control of Dynamic Systems*. Pearson. • Dorf, R.C. and R.H. Bishop, *Modern Control Systems*. Pearson. • Ogata, K., *Modern Control Engineering*. Pearson.
Assessment	• Laboratory 10% • Midterm exam 40% • Final exam (comprehensive) 50%
Language	Greek