ELEC3521 COURSE CATALOG INFO

Course Code : ELEC3521				**Course Name :** System Dynamics and Control			
Semester	**Lecture (Le+T+L)**	**Local Credit**	**ECTS**	**Language**	**Category**	**Instructional Methods**	**Prerequisites**
5	(3+1+0)	3	5	English	Core	Lecture	MATH2106 OR MATH2107, ELEC2201 OR ELEC2205
Course Content	Analysis of linear control systems by differential equations and transfer function methods. Determination of transient and steady-state response of first order and second order systems. Solution of control systems using state-space methods. Stability of closed loop systems. Routh-Hurwitz stability criterion. Root-locus diagrams. System analysis in frequency domain. Bode and polar plots. Introduction to the design of linear control systems. Compensation techniques.						
Course Outcomes	**CO 1.** Develop mathematical models of linear control systems using transfer functions and state-space models. **CO 2.** Analyze transient and steady-state behaviors of linear control systems. **CO 3.** Design the linear control systems to meet specified performance criteria. **CO 4.** Analyze the stability of linear control systems using Routh-Hurwitz stability criterion and root locus diagrams. **CO 5.** Design controllers for linear control systems so that their performance meet specified design criteria. **CO 6.** Verify performance of linear control systems using MATLAB and Simulink.						

COURSE PLAN	
W1	Introduction to the Principles of feedback
W2	Transfer function, poles, zeros, impulse response, step response, ramp response
W3	Controller types (P, I, D, PI, PD, PID), block diagram, block diagram reduction
W4	State space representation
W5	Frequency response and transfer function
W6	Transient-steady state response analysis
W7	Steady state response and system type
W8	Performance of feedback control systems
W9	Stability of linear systems

W10	Routh Hurwitz stability test
W11	Routh Hurwitz stability test
W12	Root locus analysis and design
W13	System analysis in frequency domain, Bode plots
W14	Nyquist stability criterion

COURSE ASSESMENT AND ECTS WORK LOAD			
Type of Work	**Count**	**ECTS WORK LOAD**	
		Time (Hour)(Including prep.	**Work**
Attendance	14	3	42
Final Exam	1	17	17
Quizzes		6	6
Term project			0
Reports			0
Final Project			0
Seminar			0
Assignments			0
Presentation			0
Midterms		16	16
Project			0
Laboratory		0	0
Tutorial	14	1	14
Other(Self study, Paper reviews)		30	30
		Total work load	125
		Total work load/25	5
		ECTS Credit	5

PROGRAM OUTCOMES - COURSE OUTCOMES RELATIONS		
PO	**Program Outcomes**	**CO**
1	**1.1.** Adequate knowledge in fundamentals of mathematics (algebra, differential equations, integrals, probability etc), science (physics, chemistry, biology etc.) and computer science (programming and simulation);	
	1.2. ability to use theoretical and applied knowledge in these areas in complex engineering problems.	1
2	**2.1.** Ability to identify, formulate, and solve complex engineering problems;	2,4
	2.2. ability to select and apply proper analysis and modeling methods for this purpose.	2,4
3	**3.1.** Ability to design and integrate components of a complex system or process, as they relate to Electrical and Electronics Engineering discipline, under realistic constraints and conditions, in such a way as to meet desired requirements;	3,5
	3.2. ability to apply modern design methods.	3,5
4	**4.1.** Ability to devise, select, and use techniques and tools needed for analyzing and solving complex problems encountered in engineering practice;	6
	4.2. ability to employ information technologies effectively.	
5	**5.1.** Ability to design experiments,	
	5.2. ability to conduct experiments, gather, analyze and interpret data.	
6	**6.1.** Ability to work in intra-disciplinary teams;	
	6.2. ability to work in multi-disciplinary teams;	
	6.3. ability to take individual responsibilities.	
7	**7.1.** Ability to effectively communicate via written and oral means;	
	7.2. knowledge of at least one foreign language;	
	7.3. ability to write effective reports and comprehend written reports;	
	7.4. ability to write design and manufacturing reports	
	7.5. ability to present effectively,	
	7.6. ability to give and follow clear instructions.	
8	**8.1.** Recognition of the need for lifelong learning;	

	8.2. ability to access information, to follow developments in science and technology, and to continue to educate him/herself.	
9	**9.1.** Consciousness to behave according to ethical principles, and about professional and ethical responsibility;	
	9.2. knowledge on standards used in engineering practice.	
10	**10.1.** Knowledge about business life practices such as project management, risk management, and change management;	
	10.2. awareness in entrepreneurship, innovation;	
	10.3. knowledge about sustainable development.	
11	**11.1.** Knowledge about the global and social effects of engineering practices on health, environment, and safety, and contemporary issues of the century reflected into the field of engineering;	
	11.2. awareness of the legal consequences of engineering solutions.	

Revison Date	**Prepared by**	**Approved by**
1.9.2019 1.6.2021	Prof. Dr. Yorgo Istefanopulos	Prof.Dr. Ahmet Aksen