EE222 COURSE CATALOG FORM

Course Code:EE222				**Course Name**: Circuit Theory II			
Semester	**Lc + T + L**	**Credit**	**ECTS**	**Language**	**Category**	**Instructional Methods**	**Pre Requisites**
4	4+1+0	4	7	English	Compulsory	Lecture	EE221
Course Objectives			To develop the skills required to analyze electrical properties, such as voltage, current, power and energy, in circuits driven by time varying sources; using mathematical transformations. To develop the ability of using mathematical transformations to model engineering systems.				
Course Content			Introduction to sinusoidal steady state analysis. Sinusoidal sources, concept of phasors. Phasor represantation of circuit elements in the frequency domain, in terms of impedance and reactance. Kirchoff's laws in the frequency domain. Circuit analysis techniques in the frequency domain. Analysis of transformer circuits using phasors. Sinusoidal steady state power calculations. Three-phase circuits. Laplace transform, analysis of time varying circuits using Laplace transform. Transfer function and impulse response. Convolution integral in circuit analysis. Frequency response and frequency selective circuits. Passive lowpass, highpass, bandpass and bandreject filters. Active filters based on OP-AMPs. Butterworth and Chebyshev filter characteristics. Two-port circuits and analysis.				
Course Learning Outcomes			Transform a circuit with a sinusoidal source into the frequency domain using phasor concepts and apply the circuit analysis techniques (node-voltages method, mesh-currents method, source transformations, Thevenin and Norton conversions, superposition etc.) to determine the sinusoidal steady state response of a linear circuit [1,2,6] Calculate the instantenous power, average power, reactive power, complex power and power factor in a circuit [2,6] Calculate the loading requirements for a circuit for maximum power transfer [2,6,7] Analyze the balanced three-phase circuits [2,6] Apply the Laplace transform techniques to circuit analysis [1,2,6] Calculate the transfer function and impulse response of a circuit using s-domain techniques and know how to apply convolution to determine the response of the circuit [1,2,6] Obtain the frequency response of RL, RC and RLC circuits that act as filters [2,5,6] Design RL, RC and RLC filter circuits [2,5,6,7] Design active filters with OPAMPS that behave as low-pass and high-pass filters to meet specifications of cutoff frequency and passband gain [2,5,6,7] Use computer programs such as Pspice and Matlab for circuit analysis, simulation and design problems [9,11] Get acquainted with Fourier series and transform, and understand their role in circuit and system theory [1,2] *(The numbers in square brackets denote the corresponding program outcomes.)*				
ISCED Category of the course			52 Engineering (%75), 46 Mathematics (%25)				
Textbook			J. M. Nilsson and S. A. Riedel. *Electric Circuits, 9h Edition,* Pearson Prentice Hall,.				
Other References			L. O. Chua, C. A. Desoer, E. S. Kuh. *Linear and Nonlinear Circuits.* McGraw Hill, 1987.				

COURSE PLAN

Week	Topics	Laboratory/Tutorial Work
1	Sinusoidal sources, phasor representations, characteristics of circuit elements in frequency domain, impedance and reactance. Kirchoff's laws.	Problem session covering this week's topics
2	Techniques of circuit analysis in the frequency domain. Transformers	Problem session covering this week's topics
3	Phasor diagrams for geometric solution of circuits. Power calculations for circuits with sinusoidal sources.	Problem session covering this week's topics
4	Three phase circuits	Problem session covering this week's topics
5	Laplace transform, its properties, inverse Laplace transform.	Problem session covering this week's topics
6	Analysis of time varying circuits using Laplace transform, s-domain representation of circuit elements, the transfer function.	Problem session covering this week's topics
7	The convolution integral, using the transfer function to find steady state sinusoidal responses, impulse functions in circuit analysis.	Problem session covering this week's topics
8	Frequency selective circuits, frequency response plots. Review.	Problem session covering this week's topics
9	Concept of filtering, lowpass and highpass filters.	Problem session covering this week's topics
10	Bandpass and bandstop filters, active filter circuits.	Problem session covering this week's topics
11	Active filter and higher order filter design.	Problem session covering this week's topics
12	Butterworth and Chebyshev filter design.	Problem session covering this week's topics
13	Fourier series representation of periodic functions.	Problem session covering this week's topics
14	The Fourier transform.	Problem session covering this week's topics

COURSE ASSESSMENT

	Activities	Quantity	Contribution (%)
Semester Activities	**Quizzes**	5	25
	Reports		
	Seminars		
	Homework	8	0 (Not graded)
	Presentations		
	Midterm Exams	2	40
	Project	1	10
	Other		
FINAL EXAM		1	25
Total		9	100

CONTRIBUTION of the COURSE on ELECTRICAL and ELECTRONICS ENGINEERING PROGRAM OUTCOMES

Contribution degree: 1-low, 2-medium, 3-high

	Electrical and Electronics Engineering Program Outcomes	1	2	3
1	A comprehension of mathematics (algebra, differential, integral and probability), science (physics and chemistry) and fundamentals of computer science (programming and simulation)		X	
2	Ability to apply knowledge of mathematics, science, and engineering to problems in electrical and electronics engineering			X
3	Ability to recognize the needs and challenges of our age, and to assess the global and social impacts of engineering solutions			
4	Comprehension of professional and ethical responsibility			
5	Ability to design and conduct experiments, as well as to analyze and interpret data	X		
6	Ability to identify, formulate and solve engineering problems			X
7	Ability to design and integrate electronic system components to satisfy given requirements			X
8	Ability to take individual responsibilities and to work as part of a team			
9	Ability to effectively communicate knowledge and opinions via written, oral and visual means	X		
10	Ability to recognize the need for, and be motivated to engage in life-long learning			
11	Ability to use the hardware and software based modeling, simulation, design and communication tools necessary for engineering practice		X	

ECTS - WORK LOAD TABLE

ACTIVITIES	**Quantity**	**Time (h)**	**Work Load**
Lectures	14	5	70
Final Exam (Preparation included)	1	20	20
Quizzes (Preparation included)	5	2	10
Term Project			
Reports			
Graduation Project			
Seminars			
Out class working time	14	1	14
Homework	8	2	16
Presentations			
Midterm Exams (Preparation included)	2	15	30
Projects	1	15	15
Laboratory Work			
Total Work Load			175
ECTS Credits of the course (Total Work Load / 25)			7

Revision / Date	**Coordinator / Prepared by**	**Approved by**
10/02/2015	**Onur Kaya**	**Ahmet Aksen**