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office hours/open classroom workshop:

Tuesday 3-4 pm KUPF 117
5:30-6 pm, in the office by appointment or walk-in
Wednesday 2:30-4:00 pm ECEC 100
Friday 3-4 pm, KUPF 117
5:30-6 pm, in the office by appointment or walk-in
24/7 by e-mail.
Extra office meetings available upon request.

Course Number and Title*:* ***ECE 232_101: Circuits and Systems II***
(3 credits, 3 contact hours, required course)
Text book*:* Nilsson, J.W. and Riedel, S.A., Electric Circuits, 9th Edition, Pearson Prentice Hall, Upper Saddle River, NJ. [ISBN 0-13-611499-7]

Course Catalog Description (including prerequisites and co-requisites):
A continuation of circuits and systems with special emphasis on transient response. Topics include Laplace transform analysis, transfer functions, convolution, Bode diagrams, and Fourier series.
Prerequisites: ECE 231. **Co-requisite:** Math 222.

Specific course learning outcomes (CLO): The student will be able to

1. Solve for transient responses of first order resonant circuit with single or sequential switching.
2. Solve for transient responses of a second order resonant circuit.
3. Determine Laplace Transform of an arbitrary signal including delays.
4. Demonstrate the ability to perform Inverse Laplace Transform of a rational function (including non-proper
5. and function with exponential factors).
6. Calculate a response of a circuit to an arbitrary signal using Laplace transform.
7. Develop a firm understanding of a concept of frequency response. Determine frequency response of a linear system, use Bode diagrams.
8. Determine the transfer function for a circuit and understand it's properties (poles and zeros, memory and
9. weighting function concept)
10. Use transfer function to find impulse, step and steady state sinusoidal response of a linear system.
11. Use convolution to find response of a linear system to an arbitrary time varying excitation composed of studied time signals.
12. Design a passive/active high, low, band pass, and band reject filter.
13. Find a Fourier series representation of a periodic wave form.
14. Perform power calculation for a circuit with periodic function.
15. Calculate a steady state response of a linear system to an arbitrary periodic wave.
16. Use National Instruments' Multisim circuit modeling and analysis application model.
17. Use Digilent Analog Discovery Portable Circuit Design Kit (aka Portable Lab) to perform simple analog circuit experiments.

Relevant student outcomes (ABET criterion 3):
(a) an ability to apply knowledge of mathematics, science, and engineering (CLO 1-16)
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints (CLO 1-16)
(e) an ability to identify, formulate, and solve engineering problems (CLO 1- 16)
(i) a recognition of the need for, and an ability to engage in life-long learning (CLO 16, 17)
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (CLO 16, 17).

Course Outline:

Week	Chapter/ Sections	Topics	Problems*
1	Ch 7.1-7.2	***PRE-TEST***	7.1, 7.2, 7.3, 7.6,*, 7.8,
		Pre-Test Common mistakes correction.	7.21, 7.23, 7.26,7.28, 7.30.
		First Order Systems, RL & RC. Natural Response.	
2	Ch 7.3-7.4	First Order Systems Step response.	7.33, 7.35, 7.37,
	Ch 8.1&8.4	First Order Systems General Solution with Abrupt Power Change	7.50, 7.55,
		Sequential Switching of First order systems.	*7.66, 7.68,*
		(Repeat Mutual Inductance problems)	7.70, 7.71, 7.74, 7.79, 7.81, 7.84
		Unbounded Response.	
		Second Order Systems, Series and Parallel Natural Response.	
3	Ch 8.2-8.4	Series and Parallel Step Response.	8.2, 8.5, 8.7, 8.14*, 8.18, 8.27, 8.29,
		General Solution with Abrupt Power Change.	8.39, 8.44, 8.45, 8.48, 8.53, 8.56
		Home Lab Assignment #1	
		(Materials distributed during previous week)	
4	Ch. 12.1-12.6	Definition of Laplace Transform.	12.2, 12.4, 12.7, 12.9, 12.12, 12.14,
		Properties and Theorems.	12.17, 12.19, 12.20, 12.21, 12.24
5		***QUIZ I***	
6	Ch. 12.7-12.9	Functional Transforms,	12.40, 12.41, 12.42, 12. 43, 12.46,
		Properties of Operational Transforms.	12.48, 12.52, 12.53,
		Inverse Laplace Transform.	
		Initial/Final value Theorem.	
7	Ch. 13.1-13.3	Circuit Analysis using S-domain.	13.1, 13.2, 13.3, 13.4, 13.5, 13.6, 13.7,
		Home Lab Assignment #2	13.9, 13.14*, 13.18, 13.21, 13.23,
		(Materials distributed during previous week)	13.24, 13.27, 13.29, 13.34, 13.42
8	Ch. 13.4-13.5	Transfer Functions	13.50, 13.51, 13.52, 13.57*, 13.59
9		***QUIZ II***	
10	Ch. 13.6-13.7	Convolution.	13.60, 13.61, 13.62, 13.64, 13.70,
		Steady State Sinusoidal Response.	13.74, 13.77, 13.78, 13.79*
11	Appendix E	Frequency Response. Bode Diagrams.	Problems assigned in class
12	Ch. 14.4-15.4	Passive and Active Filters	14.18, 14.19, 14.22*,14.27, 14.35,
		Home Lab Assignment #3	15.6*, 15.15, 15.22, 15.30
		(Materials distributed during previous week)	
13		***QUIZ III***	
14	Ch. 16.1-16.4	Fourier Series, Symmetries, Complex Form	16.1, 16.3, 16.12, 16.13, 16.15, 16.22
15	Ch. 16.5	Application of Fourier Series to Linear System Analysis	16.27*, 16.28, 16.29
	Ch. 16.6-16.9	Power Calculations with Fourier Series	16.34, 16.45, 16.49, 16.51

Grading Policy:

Homework, quizzes, class participation:	5%
Class Pre-test:	5%
Three class examinations:	19%, 19%, 19%.
Final examination:	28%
Take-Home Laboratory assignments:	***5% +5%extra (all reports and simulations required)***
Optional Multisim Project	*5% extra*

*15% of problems (marked with asterisk) should be solved using MultiSim (available in Computer Labs and for purchase as Student License). Getting started link: http://www.ni.com/white-paper/10710/en
Honors class fulfills 15% more work in form of homeworks, test problems and projects. Project is mandatory for the Honors section. Project is due week 14.

Tests and final exams: are closed notes and books, formula sheets allowed for test 1(one page), test 2 (two pages), test 3 and final (three pages). No solved numerical examples allowed.
PHONES ARE NOT ALLOWED ON THE TABLES DURING TESTS. *Failure to adhere to these rules forfeits the test grade.*

Attendance: required at class lectures.
Cellular phones and Beepers: Shut off or in quiet mode.

NJIT Honor Code will be upheld, and any violations will be brought to the immediate attention of the Dean of Students