ESE 271: Electrical circuit analysis

Fall 2017

2016-2017 Catalog Description:

The course is designed to provide the necessary theoretical background for electronic lecture and lab courses like ESE 211, 218, 311, 314, 324, 372, etc. The course covers the following topics: passive circuit elements: resistors, capacitors, inductors. Elements of circuit topology. Kirchhoff's and Ohm's law. Nodal and mesh analysis. Equivalent circuits. Steady-state AC circuits. Phasors. Transient analysis. Fourier and Laplace transforms. Fundamentals of AC power, coupled inductors (transformers). Two-port networks.

Course Designation: Required Course

Text Books: Main: Charles K. Alexander and Matthew N.O. Sadiku "Fundamentals of Electric Circuits", McGraw Hill, ISBN 978-0-007-352955-4

Additional: R.E. Thomas, R.J. Rosa, G.J. Toussaint "The analysis and design of linear circuits", 7 th Edition, Willey, ISBN 978-1-119-06558-47

Prerequisites: MAT 127 or 132 or 142 or 171 or AMS 161; PHY 127 or 132/134 or 142.

Credit Hours: 4

Instructor: **S.Suchalkin**

Goals: The goal of the course is to develop skills of theoretical circuit analysis and circuit design.

Course Learning Outcomes: Upon completion of the course, students will have:

- understanding of the operation principles of the electronic circuits
- experience in analysis of DC, AC and transient response of electronic circuit.
- some knowledge of contemporary issues;
- an awareness of the importance of lifelong learning
- practiced communication skills

Topics Covered:

Week 1	Tue Aug. 29	Lecture 1. Basic concepts: current, voltage, power.	
	Thu Aug. 31	Lecture 2. Resistor. Ohm's law. Kirchoff's laws.	
Week 2	Tue Sept. 5	Labor day	
	Thu Sept. 7	Lecture 3. Circuit theorems.	
Week 3	Tue Sept. 12	Lecture 4. Dependent sources and operational amplifiers.	HW1 is due
	Thu Sept. 14	Lecture 5. Nodal and Mesh analysis.	
Week 4	Tue Sept. 19	Lecture 6. Circuits with operational amplifiers.	
	Thu Sept. 21	Lecture 7. Material review.	HW2 is due
Week 5	Tue Sept. 26	Midterm exam 1.	
	Thu Sept. 28	Lecture 8. Capacitors.	
Week 6	Tue Oct. 3	Lecture 9. Inductors.	
	Thu Oct. 5	Lecture 10. RC and RL circuits. Time constants.	
Week 7	Tue Oct. 10	Lecture 11. Phasors. Impedance. RLC circuits.	HW3 is due
	Thu Oct. 12	Lecture 12. AC steady state. Nodal analysis.	
Week 8	Tue Oct. 17	Lecture 13. AC steady state. Mesh analysis.	
	Thu Oct. 19	Lecture 14. First order circuit. Transfer functions. Bode plots.	
Week 9	Tue Oct. 24	Lecture 15. Complex power. RMS.	HW4 is due
	Thu Oct. 26	Lecture 16. Magnetically coupled circuits. Transformers.	
Week 10	Tue Oct. 31	Lecture 17. Material review.	
	Thu Nov 2	Midterm exam 2.	
Week 11	Tue Nov. 7	Lecture 18. Laplace transform.	
	Thu Nov. 9	Lecture 19. Laplace transform.	
Week 12	Tue Nov. 14	Lecture 20. Laplace transform.	
	Thu Nov. 16	Lecture 21. Circuits in s-domain. Transfer functions.	HW5 is due
Week 13	Tue Nov. 21	Lecture 22. Step and impulse response. Poles. Stable circuits.	
	Thu Nov. 23	Thanksgiving break.	
Week 14	Tue Nov. 28	Lecture 23. Frequency response function. Bode plots.	
	Thu Nov. 30	Lecture 24. Resonant filters.	
Week 15	Tue Dec. 5	Lecture 25. Two port networks.	HW6 is due
	Thu Dec. 7	Lecture 26. Material review.	
Finals	Dec. 12-20	Final exam (non cumulative).	

Class Schedule: 2.6 lecture hours and 1 recitation hour per week.

Student Outcomes	**% contribution***
❑ (a) an ability to apply knowledge of mathematics, science and engineering	35
❑ (b1) an ability to design and conduct experiments	18
❑ (b2) an ability to analyze and interpret data	17
❑ (c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability	
❑x (d) an ability to function on multi-disciplinary teams	
❑ (e) an ability to identify, formulate, and solve engineering problems	
❑x (f) an understanding of professional and ethical responsibility	
❑x (g) an ability to communicate effectively	
❑x (h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context	
❑ (i) a recognition of the need for, and an ability to engage in life-long learning	
❑ (j) a knowledge of contemporary issues	
❑ (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice	30
❑ Any other outcomes and assessments?	

* Assume that the total contribution of any course will be 100%. Use the right hand column to indicate the approximate percent that the left hand columns contribute to the overall course.

Document Prepared by: Sergey Suchalkin
Date: August, 2016