ECE 213 – Circuit Analysis II

Credits: 3, **Contact Hours:** Two 75-minute lecture session per week, one 160-minute laboratory session per week.

Coordinator: Hassan Shanechi, Senior Lecturer of ECE

Textbook: Fundamentals of Electric Circuits, By: C. K. Alexander and M. N. O. Sadiku, McGraw-Hill, 7th Edition 2020

Catalog Data: Circuit Analysis II
Sinusoidal excitation and phasors. AC steady-state circuit analysis using phasors. AC steady-state power, RMS values, introduction to three-phase systems, magnetically coupled circuits, transformers, network functions, pole-zero analysis, frequency response, resonance, application of Laplace transform, two-port networks, transistor models.
Laboratory experiments include familiarization with test and measurement equipment, design-oriented experiments include operational amplifiers; transient effects in first-order and second-order analog circuits; PSpice software applications, sinusoidal steady state analysis, power measurements and power factor correction transformer principles, frequency response of active networks, junction-diode basics.

Prerequisites or co-requisites by topic: ECE 211 with a grade C or better. (3-3-4) (C)

Enrollment: Required course for EE majors

Specific outcomes of instruction:
Below are listed the objectives for this course as adopted by the ECE faculty.
After completing this course, the student should be able to do the following:

1. Demonstrate ability to analyze circuits using both phasor notation and sinusoidal functions of time.
2. Demonstrate ability to apply all circuit analysis techniques to the analysis of AC circuits.
3. Demonstrate ability to calculate instantaneous power, average power, and complex power in AC circuits; to determine RMS values of voltage and current; to apply the maximum power transfer theorem; and to correct the power factor in a circuit.
4. Demonstrate ability to work with three-phase circuits.
5. Demonstrate ability to analyze circuits containing mutual inductances and transformers.
6. Demonstrate ability to use Laplace transforms to solve AC circuits in the time and frequency domains.
7. Given a two-port network, calculate its admittance, impedance, hybrid, and transmission parameters.
8. Be familiar with transistor circuit model.
9. Work with lab equipment and perform experiments and make measurement and analyze errors in sinusoidal circuits.

Relationship of ECE 213 specific outcomes of instruction to student outcomes:

	Student Outcomes	**Course Goals**
1	An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	1,3,4,5,6,7,8
2	An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	3,9
3	An ability to communicate effectively with a range of audiences	9
4	An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	
5	An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	9
6	An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	9
7	An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	

Topics:

- Introduction, Sinusoids, Phasors, Impedance and Admittance, Kirchhoff's Laws (1.5 weeks)
- AC Steady State Analysis (2 weeks)
- Steady State Power Analysis and Power Factor Correction (1.5 weeks)
- Three-phase Circuits (1 week)
- Magnetically Coupled Circuits (1 week)
- Frequency Response, Transfer Function, Bode Plots (1.5 weeks)
- Series and Parallel Resonance (0.5 week)
- Using PSpice and MATLAB (0.5 week)
- Laplace Transform Review and Applications in Circuit Analysis (2 weeks)
- Two Port Networks (1 week)
- Simple Transistor Models and Circuits (1 week)
- Review and Tests (1.5 weeks)

Laboratory topics:

- Lab Introduction and Basic Safety Practices (1 week)
- Instruments (2 week)
- Introduction to PSpice (1 week)
- Transients in First Order Systems (1 week)
- Sinusoidal steady state analysis (2 week)
- Power measurement and power factor correction (1 week)
- Transformer principles (1 week)
- Frequency response of active networks (1 week)
- Junction-Diode Basics (1 week)
- Tests and make up labs (3 week)

Prepared by: Hassan Shanechi **Date:** March 1, 2020