ECE405 Electrical Engineering Principles

Course Description:

Provides non-electrical engineering students a basic understanding of the principles and analysis of electric circuits while exposing them to key electrical engineering applications.

Pre-Requisite:

Phy 121

Textbook:

Electrical Engineering,
PRINCIPLES and APPLICATIONS
7thEdition *by Allan R. Hambley*

- PUBLISHER: McGraw-Hill
- ISBN:978-0-13-311664-9

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Honor Code:

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

Course Structure:

- All Lectures will be pre-recorded and posted on Canvas.
- Few topics have a pre-read Lecture video along with a pre-read quiz.
- The worksheets used in the course and their solutions are available on Canvas.
- The worksheet problems are solved in the recorded lectures.
- The relevant problem numbers, to be practiced from the end of the chapter, are on Canvas.
- Answer key to those problems are on Canvas too. The solutions to both 6^{th} and 7^{th} edition relevant problem numbers have been posted.
- There will be an online **Quiz** on each module .The dates for the quiz can be read from the available dates for each quiz. There will be a very short window for the availability of the quiz. I expect the quiz to be taken simultaneously by all students.
- The Midterms and finals will also be conducted simultaneously for all students using Lockdown browser and a webcam.
- The Midterms and Finals will be multiple choice/true-false/Numerical answer type. You will not be expected to show or upload any working.

- There will be office hours for each topic where you can discuss questions, doubts and concepts you need help with.
- The office hours will be recorded and uploaded on Canvas for your reference.

Grading :

- Midterm 1 - 20%
- Pre-Read Quizzes and Online quizzes – 20%
  - Two lowest quiz grade will be dropped.

- Midterm 2 - 20%
- Final Exam- 30%
  - Final Exam is cumulative.

IMP: If you have any questions regarding grading of any quiz/exam, you can reach out to me **within one week** after the grades have been posted. I will not entertain any such request or queries later.

Grading methods:

Partial credit will be given for essay (open ended) type of questions of the Online Quiz where you are expected to show your work. For such questions no work shown will earn zero credit.

Midterms and Finals:

- The exams will be closed book and closed notes.
- The questions on the exams will be based on suggested practice problems (at the end of chapter problems) and the worksheet problems.
- You will be allowed to use the formula sheet which is available on Canvas. You can print it before hand and use it. If you don't have a printer you can copy the formula sheet on a blank paper and use it.
- If anybody caught with his own formula sheet, his/her exam will not be graded.

Course Schedule:

WEEK	Topics	Chap	Pages
1	Overview; Circuits Currents and Voltages; Power and Energy; Kirchhoff's Current and Voltage Laws; Introduction to Circuit Elements Introduction to Circuits	Ch1,	2-35
2	Resistances in Series and Parallel Voltage divider and Current Divider circuits Network Analysis using Node Voltage Method and Mesh Current Method,	Ch2	46-87

3	Principle of Superposition , Thevenin's Equivalent, Norton's Equivalent, Maximum Power Transfer, Wheatstone Bridge	Ch2	88-107
4	Energy Storage Circuit Elements: Capacitors and Inductors	Ch3	124-144 Sec 3.1-3.5
5	Transients	Ch4	162-174 Sec 4.1-4.4
6	MIDTERM I Complex Numbers		
7,8	Steady-State Sinusoidal Analysis	Ch 5	209-230
9	AC Power,	Ch5	231-243
10	Magnetic Circuits and transformers	Ch 15	709-737
11	Midterm 2		
12	DC Machines	Ch16	754-793
13	AC Machines	Ch17	803-
14	Over-run, Review for Finals		

Module	**TOPIC**	**Quiz**
1	DC Circuits-Basics	Quiz1
2	Equivalent R	Quiz2
	Node and Mesh Analysis	Quiz 3
3	Thevenin's and Norton Ckts	QUIZ 4
4	Capacitor and Inductors	QUIZ 5
5	Transients	QUIZ 6
	MIDTERM I	
6	Complex Numbers	QUIZ 7
7	Complex V I and Z	QUIZ8
8	AC Power	Quiz 9
9	Transformer	QUIZ10
	MIDTERM II	
10	DC Machines	
11	AC Machines	

	FINALS	

Course Learning outcomes:

After successful completion of course a student should be able to:

1 Apply Ohm's Law to solve circuit problems.
2 Apply Kirchhoff's Current Law to solve circuit problems.
3 Apply Kirchhoff's Voltage Law to solve circuit problems.
4 Understand circuit elements and i-v characteristics.
5 Determine electrical power sources and sinks in a circuit and calculate the magnitude of the power.
6 Understand and use the Node Voltage method to solve circuits.
7 Understand and use the Mesh Current method to solve circuits.
8 Understand and use Norton and Thevenin's equivalent circuits.
9 Understand and use Superposition to solve circuits.
10 Understand and use the idea of maximum power transfer.
11 Understand how to solve DC and AC circuits with inductors and capacitors.
12 Understand and use phasor and rectangular form for sinusoidal circuits.
13 Understand and use first-order differential equations for transient analysis of circuits containing a single capacitor or inductor.
14 Understand power in AC circuits and apply the concept of complex power.
15 Understand the use of transformers and solve circuits containing them.

16 Understand the basic principles of rotating electric machines.

Student Outcome:

Student outcome	Relevant Course Outcome	
1	1to 16	an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
7	1 to 16	an ability to acquire and apply new knowledge as needed, using appropriate learning strategies