ECE 405- Electrical Engineering Principles

Tentative Course Outline **Fall 2023**

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Office Hours: Mondays and Thursdays 11:00-12:00 or by appt.

Days	Times	Location
MR	02:30 PM - 03:50 PM	TIER LECT 1

Textbook: Fundamentals of Electrical Engineering, 2nd Edition, By Giorgio Rizzoni
ISBN: 978 0073380568 (bound edition), 978-1-259-91443-0 (loose-leaf edition)

Other Learning Resources: Massive Open Online Courses (MOOCs) are free online courses available for anyone to enroll. You can search for courses with a title similar to "Electrical Circuit Analysis", and you may find a course that fits best your learning style. For example, a quick search resulted in the following two courses from Georgia Tech.:
https://www.coursera.org/learn/linear-circuits-dcanalysis This will be referred to as coursera.DC
https://www.coursera.org/learn/linear-circuits-ac-analysis This will be referred to as coursera.AC
A quick Youtube search also shows similar courses from Caltech:
https://www.youtube.com/watch?v=H00Z2qa_a0c&list=PLc7Gz02Znph_HU1I9STgC4Nv0aG_jdb8Z&index=2.

Course Policy: The maximum number of points is 150, divided as follows: 2 tests: 35 points each, final exam: 50 points, 30 points for homework (HW), and for short pop quizzes. These pop quizzes are usually given the day you submit a HW and it will be based on the HW you will have just submitted.
Letter grades will be given according to the following table:
A≥ 90.0%
90% > B+≥ 80%
80% > B ≥ 70%
70% > C+≥ 60%
60% > C ≥ 50%
50% > D ≥ 40%
40% > F
Homework: Homework (HW) is due on Mondays unless otherwise notified. Solutions to homework problems may be available on the web. Please, DO NOT COPY solutions from the web or any other source (including colleagues) and present the solutions as your own. This is unethical and unwise. Always try the problem yourself first. Refer to the solution (if available) and seek external help, ONLY after you have gotten stuck, and only to get unstuck. Getting stuck (finding out what you don't know) is an important step in the learning process.

Copying solutions and present the solutions as your own will be penalized according to the Honor Code of NJIT (Please see the section about the "Honor Code" below..

Please use the cover sheet at the end of this outline as the first page of every homework you submit

The Honor Code: *"Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at:* http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf.

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. **Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university.** *If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at* dos@njit.edu"

Time Requirements: This course is a three credit-hours course. Assuming the average load of a full-time student is 15 credit-hours, and assuming a full-time student works 45 hours/week towards his/her studies, then this course require 9 hours of study and class time per week on the average.

Catalog Description: Prerequisites: PHYS 121 or PHYS 122 and Junior standing. (No credit for ECE students.) For non-electrical engineering majors. Topics include basic dc and ac circuits, basic electronics, an introduction to electromechanical energy conversion and control theory.

Tentative Weekly Schedule:

Homework problems will be assigned on a weekly basis.

Dates M- Monday R= Thur.	Topics **CLI = Coursera Lesson from Linear Circuits 1** **CL2 = Coursera Lesson from Linear Circuits 2**	Sections/ Pages	Coursera Modules
R 9/7	Introduction, circuit components, Coursera course, Matlab	Pages from Chapter 1	CL1 1.1
Week 1 and 2 9/11, 9/14, 9/18, and 9/21.	Fundamentals of Electric Circuits: current, voltage, power, current division **(CL 2.6**), voltage division (**CL 2.5)**, resistive circuits.	Chapters 1	CL1: 1.2 to 1.5; 2.5 and 2.6
Week 3 and 1/2 9/25 to 10/2	.Network Analysis, the node voltage method, Mesh-Current Methods. HW due 10/5	Chapter 2 Sec. 2.1, 2.2, and 2.3	CL1 3.3, 3.4
Week 4 and 5 10/4 to 10/12	Circuit Analysis: superposition, Power Sources and Transformation Methods, Thevenin's Equivalent, Maximum Power Transfer.	Chapter 2 Sec. 2.4, 2.5, and 2.6	CL1: Module 4
Week 6 10/16 & 10/19	Inductance, Capacitance, Properties of the inductor, properties of the capacitor, series and parallel combinations of inductance and capacitance, mutual inductance. Learning resource for capacitors: coursera.DC (Week 5, Lesson 1,2,3).Learning resource for inductors: coursera.DC (Week 5, Lesson 4, 5, 6)	Chapter 3 Section 3.1	CL1: Module 5
Monday 10/23	Test I		
Week 7 & 8 10/26, 10/30, and 11/2	Time dependent sources, Sinusoidal Steady-State Analysis: Passive elements in the Frequency Domain, The Phasor & Transformers.	Chapter 3 Section 3.2-3.5	Module 1 of CL2, and CL1: 4.2 (for RMS)

Week 9 11/6 &11/9	Sinusoidal Steady-State: Power, P, Q, S, Maximum Power Transfer	Chapter 6 Sections 6.1 to 6.3	CL2: 4.1, 4.3, 4.4, 4.5
Week 10 11/13 and 11/16	Transformers	Chapter 6 6.4	5.1, 5.2, 5.3
Week 10 11/20 & 11/23	Three-phase power and residential wiring, power generation and distribution	6.5, 6.6, and 6.7	
Monday 11/27	Test II		
Week 11& 12 11/21. 11/27, and 11/30 11/21 Thursday classes	Rectifiers Circuits, the transistor as a switch, gates	8.5, 9.5	
Week 13 12/4 &12/7	Digital Logic Circuits	Chapter 11	
Week 14 12/11 Last day 12/13	Introduction to electrical machines	Chapter 13	HW1: 6.:- 2, 3, 5, 9, 11, 15, 17, 19, 20, 23, 26, 30, 31. HW2:

Chapters of Textbook for Reference:

Chapter 1 Fundamentals of Electric Circuits
Chapter 2 Resistive Network Analysis
Chapter 3 AC Network Analysis
Chapter 4 Transient Analysis
Chapter 5 Frequency Response and System Concepts
Chapter 6 AC Power
Chapter 7 Operational Amplifiers
Chapter 8 Semiconductors and Diodes
Chapter 9 Bipolar Junction Transistors: Operation, Circuit Models, and Applications
Chapter 10 Field-Effect Transistors: Operation, Circuit Models, and Applications
Chapter 11 Digital Logic Circuits
Chapter 12 Principles of Electromechanics
Chapter 13 Introduction to Electric Machines

ECE 405 HW#

Name: **Date Submitted:**
Roster# **Problem Solved:**