

ENPH 225 Electrical Circuit Theory

Department: Mathematics, Physics and Engineering

Credit Hours: 4

Current Catalog Description:

Electrical Circuit Theory (3-3) Resistive circuits: circuit laws, network reduction, nodal analysis, mesh analysis; energy storage elements; sinusoidal steady state; AC energy systems; magnetically coupled circuits; the ideal transformer; resonance; introduction to computer applications in circuit analysis.

Course Schedule:

3 lecture hr/ wk, 3 lab hr/week

Coordinator:

Dr. Mircea Agapie

Prerequisites by Topic:

PHYS 242 — Principles of Physics II: (co requisite)

MATH 209 — Calculus II (co requisite)

Course Learning Goals and Program Outcome Map:

The Program Outcomes for Engineering Physics are:

- A. an ability to apply knowledge of math, engineering & science
- B. an ability to design and conduct experiments, as well as to analyze and interpret data
- C. an ability to design system, component or process to meet needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- D. an ability to function on multi-disciplinary teams
- E. an ability to identify, formulate, and solve engineering problems
- F. an understanding of professional and ethical responsibility
- G. an ability to communicate effectively
- H. the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- I. a recognition of need for, and ability to engage in life-long learning
- J. a knowledge of contemporary issues
- K. an ability to use techniques, skills, and modern engineering tools necessary for engineering practice.
- L. a depth and breadth of knowledge in engineering and physics necessary to work in a multidisciplinary environment

Course Goals	Program Outcome(s):
Upon completion of this course with a C or better, students will	
1. Know Ohm's law, KCL, KVL, and power relationships and how to apply them to DC and AC electrical circuits.	A
2. Know how to use basic electronic lab equipment including oscilloscope, function generator, multi-voltage power supply, and multimeter to measure the performance of circuits.	B, K
3. Be able to model the performance of electrical circuits containing resistors, capacitors, inductors and transformers using computer simulation tools (e.g. Multisim, Orcad, NI Elvis) and symbolic programming languages (e.g. Maple, MATLAB) to predict their steady state, transient, and frequency domain performance.	A, B, K
4. Be able to design and breadboard simple circuits (containing resistors, capacitors, inductors, and transformers) with given performance parameters. Understand how changes of individual component parameters affect the parameters of the overall circuit.	B, C, E
5. Be able to communicate orally and in writing concerning their solutions to problems, performance predictions and measurements.	G

Topics:

Topic	# Lec/Lab (approx.)
Review of the physical concepts of charge, voltage, current, power and energy. Deriving KCL and KVL from physical considerations. Resistors and Ohm's law. Applying Ohm, KCL and KVL to simple circuits.	3/3
Resistive circuits: voltage and current dividers, series, parallel, delta-wye, resistive power, node voltage and loop currents analysis, Thevenin and Norton equivalent circuits, controlled sources. Wheatstone bridge.	6/6
Capacitors and inductors as circuit elements: "Ohm's law" for capacitors and inductors, power and energy stored in the electric and magnetic fields, parasitic effects.	3/3
Transients in 1 st and 2 nd order circuits, normalized step response.	6/6
Other (to be determined)	
Exams	3/0

Academic Honesty:

Cheating, plagiarism (submitting another person's materials or ideas as one's own), or doing work for another person who will receive academic credit are all-impermissible. This includes the use of unauthorized books, notebooks, or other sources in order to secure or give help during an examination, the unauthorized copying of examinations, assignments, reports, or term papers, or the presentation of unacknowledged material as if it were the student's own work. Disciplinary action may be taken beyond the academic discipline administered by the faculty member who teaches the course in which the cheating took place.

Students with Disabilities Policy:

It is the policy of Tarleton State University to comply with the Americans with Disabilities Act (ADA) and other federal, state, and local laws relative to the provision of disability services. Students with disabilities attending Tarleton State University may contact the Office of Disability Services at (254) 968-9478 to request appropriate accommodation. Furthermore, formal accommodation requests cannot be made until the student has been officially admitted to Tarleton State University.

Contribution of Course to Meeting the Professional Requirement:

Engineering Topics: 100%

Status of Continuous Improvement Review of this Course:

Prepared by: *Mircea Agapie*

Date: *May 1st 2005.*

Reviewed by: *Denise Martinez*

Date: *May 18, 2005*

Review Notes:

Elaborate on topic coverage or length of time spent on topics – dmm

Reviewed by: *Falih Ahmad*

Date: *January 20, 2008*

Review Notes:

01/20/08 – updated the list of the prerequisites – FHA