University of Toledo
Electrical Engineering Technology
Master Syllabus

Course Title: Reactive Circuits **Course Code & Number:** EET-1020

Credit Hour Total: 4 **Weekly Contact Lecture Hours:** 3 **Lab Hours:** 2

Prerequisites: Trigonometry (MATH 1330) and Resistive Circuits (EET 1010)

Text: Floyd, Principles of Electric Circuits, Conventional Current Version, 9th Ed, Prentice Hall, 2010

Laboratory Manual

Software: Multisim 14 (Electronics Workbench)

Course Coordinator: Kamm

A. Course Description

This course involves transient analyses of first order reactive DC circuits and steady state analyses of reactive circuits under AC conditions. Frequency response, three phase analysis, oscilloscope usage and Multisim simulation methods are also included.

B. Related Program Outcomes:

ABET/Student Outcomes

a. An understanding of the analytical skills associated with electrical engineering technology, as evidenced by the ability to perform a steady state AC circuit analysis for a series RLC circuit.

b. An ability to select and apply knowledge of mathematics, science, engineering, and technology to engineering technology programs that require the application of priniples and applied procedures or methodologies.

c. An ability to conduct, analyze, and interpret experiments concerning reactive AC electrical circuits, as evidenced by the data and data analyses associated with laboratory notebooks and reports.

e. An ability to function as part of a team, as evidenced by attendance and participation in the conduct of laboratory experiments with laboratory partners.

f. An ability to identify, analyze and solve technical problems associated with electrical engineering technology, as evidence by the ability to solve an assortment of reactive circuit problems on the final exam.

g. An ability to communicate effectively, as evidenced by short format and long format laboratory reports.

Program Criteria

a. The application of circuit analysis and design, computer programming, associated software, analog and digital electronics, and microcomputers, and engineering standards to the building, testing, operation, and maintenance of electrical/ electronic(s) systems.

C. Course Objectives:

1. Develop an understanding of the analytical techniques used for reactive circuits under DC and steady state AC conditions.
2. Develop an understanding of the laboratory skills used to evaluate reactive circuits under DC and steady state AC conditions.
3. Analyze and interpret laboratory data from basic reactive circuits.
4. Work effectively in the laboratory with lab partners.
5. Identify and solve reactive circuit problems under DC and steady state AC conditions.
6. Communicate the results of circuit analyses in written reports.

D. Course Outline – Major Content Areas

- Sinusoidal wave properties.
- Complex numbers and phasors.
- Properties of capacitors and their behavior under DC conditions.
- Properties of inductors and their behavior under DC conditions.
- Behavior of transformers.
- Steady state behavior of RC circuits under AC conditions.
- Steady state behavior of RL circuits under AC conditions.
- Steady state behavior of RLC circuits under AC conditions.
- Analyses of basic filter circuits.
- Superposition, Thevenin's theorem and Norton's theorem under AC conditions.
- An introduction to three phase systems.

E. Major Laboratory Topics

- An introduction to the Multisim 7 simulation software with sinusoidal sources.
- The oscilloscope and the signal generator.
- Capacitors – RC circuits and time constants.
- Measuring RC time constants with an oscilloscope.

- Inductors – RL circuits and time constants.
- Series RC circuits with AC sources.
- The frequency response of a series RC circuit.
- Series / parallel RC circuits with AC sources.
- Series RL circuits with AC sources.
- Series RLC resonant circuits.
- Parallel RLC resonant circuits.