

SOUTHEAST COMMUNITY COLLEGE
CONSTRUCTION MANUFACTURING AND TECHNOLOGY DIVISION
Electrical/Electromechanical Technology Program
Revision Date: August 22, 2022

I. CATALOG DESCRIPTION

Course Number: ELEC1217
Course Title: AC Principles
Prerequisite(s): ELEC1131
Corequisite(s): MATH1020 or higher
Catalog Description: A study of AC circuits using passive and reactive components, including series resonance and power factor correction circuitry. Single-phase transformers are introduced, along with power supply rectification and filtering. The oscilloscope is utilized to measure phase shift and to make indirect measurements. Introduction to three phase systems concepts also are covered.

Credit Hours: 5
Class Hours: 45
Lab Hours: 90
Total Contact Hours: 135

II. COURSE OBJECTIVES: *Course will:*

- A. Analyze AC Voltage & Current Waveforms.
- B. Demonstrate advanced measurements using VOM, DMM, and Oscilloscope techniques.
- C. Demonstrate how to make indirect electrical measurements including Phase shift and Power Factor.
- D. Analyze Reactive and Resistive components in AC circuits.
- E. Discuss power in AC circuits (Watts, VARs, VAs)
- F. Explain Transformer operations and applications.

III. STUDENT LEARNING OUTCOMES AND GENERAL EDUCATION LEARNING OUTCOMES:

- A. Student Learning Outcomes: *Student will be able to:*
 - 1. Describe the use of resistors, capacitors inductors and diodes in alternating current (AC) circuits.
 - 2. Properly use test equipment to measure AC circuits.
 - 3. Explain basic power supplies and passive filters.
 - 4. Use AC test equipment (analog and digital) and understand specifications pertinent to such equipment.
 - 5. Construct, analyze, and troubleshoot RL and RC circuits.
 - 6. Construct, analyze, and troubleshoot both series and parallel resonant and non-resonant circuits.
 - 7. Predict and measure the response of an RL and RC circuit with a square wave or pulse wave applied.
 - 8. Use test equipment to check diodes and transformer characteristics.
 - 9. Discuss winding resistance, open circuit test and short circuit test.
 - 10. Construct, measure, analyze and troubleshoot basic power supplies.
- B. General Education Learning Outcomes (GELOs)
 - 1. GELO #3: Critical Thinking & Problem Solving
Outcome 2: Synthesize information to arrive at reasoned solutions to problems.

IV. CONTENT/TOPICAL OUTLINE

- A. AC Electronics**
 - 1. Analysis Of AC Voltage & Current Waveforms**
 - a.** The sine wave
 - b.** Out of phase sine waves
 - c.** Rotating vectors
 - d.** Mathematical relationships of RMS, PEAK, PEAK-TO-PEAK and average values
 - e.** Non-sinusoidal waveforms
 - f.** AC meters and how they respond
 - 2. Series AC Circuits**
 - a.** AC resistive, capacitive & inductive reactance
 - b.** RC AC circuits
 - c.** RL AC circuits
 - d.** RLC AC circuits
 - e.** Frequency response of non-resonant AC circuits
 - f.** Adding complex impedances & voltages
 - g.** Series resonance
 - h.** Pulse and square wave analysis.
 - 3. Parallel AC Circuits**
 - a.** Parallel RL & RC circuits
 - b.** Impedance input filters
 - c.** Parallel RLC AC circuits
 - d.** Frequency response of non-resonant circuits
 - e.** Parallel resonance – Power Factor Correction
 - 4. Transformers**
 - a.** Transformers operation
 - b.** Reflected impedance
 - c.** Transformer open circuit & short circuit tests
 - d.** Autotransformers
 - 5. Rectification & Filtering**
 - a.** Semiconductor diodes
 - b.** Diode ratings & temperature effects special purpose diodes
 - c.** Half wave rectifiers
 - d.** Full wave rectifiers
 - e.** Bridge rectifiers
 - f.** Clipper/Clamper circuits

V. INSTRUCTIONAL MATERIALS

- A.** Required Text(s): Floyd, Thomas L., *Electronic Fundamentals: circuits, devices and applications*, (Refer to CID and/or instructor for current edition)
- B.** Other Resources: Outside reading/research required as needed
- C.** Supplies: Scientific Calculator

VI. METHODS OF PRESENTATION/INSTRUCTION

- A.** Methods of presentation typically include a combination of the following:
 - 1.** Lecture
 - 2.** Lab

VII. METHODS OF EVALUATION

- A.** Methods of evaluation, although determined by the individual instructor, traditionally includes a combination of the following:
 - 1.** Homework
 - 2.** Quizzes
 - 3.** Exams
 - 4.** Lab Projects
 - 5.** Lab Tests

VIII. SPECIFIC COURSE REQUIREMENTS

- A.** A minimum grade of 60% is required.
- B.** Cheating within the Manufacturing Division: Any violation of academic integrity on assignments, quizzes, or tests will result in a grade of 0 on that assignment, quiz, or test. A second violation in any course after the initial infraction will result in a grade of F for that course. Any additional violations while in the program will result in a suspension from the program.
- C.** Credit by Examination: Credit for the course CANNOT be earned through Credit by Examination.