

J. Sargeant Reynolds Community College
Course Content Summary

Course Prefix and Number: EGR 271 **Credits:** 4

Course Title: Electric Circuits 1

Course Description:

Covers fundamentals of electric circuits. Teaches resistive circuit analysis methods, including network theorems. Teaches operational amplifiers, capacitors, inductors, resistor-capacitor (RC), resistor-inductor (RL) and resistance-inductance-capacitance (RLC) circuit transient response. Introduces phasor representation of alternating current (AC) circuits. Utilizes circuit design processes, technical writing and computer software for problem solving. Includes laboratory analysis to explore course concepts. Prerequisite: MTH 264 and EGR 121. Lecture 3 hours, Laboratory 3 hours, Total 6 hours per week. 4 credits

General Course Purpose:

EGR 271 provides fundamental skills in circuit analysis and design for resistive, RC, RL, RLC and op amp circuits.

Course Prerequisites/Corequisites:

MTH 264 and EGR 121

Course Objectives:

Upon completing the course, the student will be able to:

Electrical quantities

- Define and calculate electrical quantities of charge, current, voltage, power and energy

Resistive circuit analysis

- Analyze resistive circuits by combining series and parallel resistance
- Apply Ohm's Law, Kirchhoff's Voltage and Kirchhoff's Current Law in analyzing resistive circuits
- Apply voltage division and current division to the analysis of resistive circuits

Systems of equations

- Apply techniques for solving systems of equations
- Analyze circuits using node voltage and mesh analysis techniques

Network Theorems

- Use network theorems or network reduction techniques, such as superposition and Thevenin's Theorem, to analyze or simplify resistive circuits.

Operational Amplifiers

- Use linear models to represent operational amplifiers

- Analyze operational amplifier circuits
- Include applications of op amp circuits

RC, RL, and RLC Circuits

- Define basic properties of capacitors and inductors.
- Define and calculate voltage, current, power and energy for capacitors and inductors.
- Analyze RC and RL circuits with constant forcing functions
- Analyze RLC circuits with constant forcing functions

Phasors

- Perform calculations using complex numbers (math)
- Introduce the use of phasors to represent sinusoidal steady state signals, and circuit elements

Lab Equipment Usage

- Use a power supply and function generator as sources for circuit
- Use a multimeter and oscilloscope to measure DC and AC quantities

Lab Work

- Design and build circuits to explore course topics
- Design and build circuits based on specified criteria
- Utilize simulation, programming environments, and lab equipment to analyze circuits and designs
- Write clear, cogent, succinct technical reports

Major Topics to be Included:

- Electrical quantities
- Resistive circuit analysis
- Systems of equations
- Network Theorems
- Operational Amplifiers
- RC, RL, and RLC Circuits
- Phasors
- Lab Equipment Usage
- Lab Work

Effective Date/Updated: August 1, 2023