## *ENGR 240: Circuit Analysis*

**Credits (semester):** 4

**Contact Hours:** 3 \* 65 (lecture) + 180 (lab) = 375 minutes/week

**Course Coordinator:** Dr. Greg Mowry

**Textbooks and Supplemental Materials**

*“Basic Engineering Circuit Analysis, 11e”* by Irwin & Nelms. Wiley ISBN: 978-1-118-95599-4, 2015.

**Catalog Description**

Introduction to linear circuit analysis and basic electronic instrumentation. Students will learn linear models of passive components and sources as well as how real components depart from those models. Circuit analysis techniques including nodal and mesh analysis, equivalence theorems and computer simulation will be covered. Laplace transform techniques will be used to examine sinusoidal steady state and transient circuit behavior.

**Prerequisites**

PHYS-112 and concurrent registration with or prior completion of MATH-210

**ENGR 240 is a required course in the EE and Computer Engineering Programs.**

**Course Learning Outcomes** *(Letters in parentheses refer to student outcomes)*

**Learning Outcomes**

1. Understanding of the principles of linear circuit analysis as demonstrated in quizzes, homework, and tests. (k)
2. Ability to apply those principles to the design and analysis of practical circuits as demonstrated in laboratory experiments and student design projects. (a,e,g,k)
3. Ability to use software tools and lab instruments to design, simulate, build, test and document first-order-simplicity circuits using discrete passive components and operational amplifiers. (k)
4. Reading the book and proving results. (g)

**Skills**

Upon successful completion of the course, the student will be able to:

1. Use power supplies, signal generators, and oscilloscopes for testing circuits (k)
2. Determine voltages and currents in a circuit using nodal and mesh analysis (a, e)
3. Use Norton and Thevenin theorems to convert between equivalent circuits (e)
4. Perform arithmetic on complex numbers (a)
5. Use phasor representation to determine steady state frequency analysis of circuits (a, e)
6. Create and interpret Bode plots for two port networks (a)
7. Determine the transient response of first order and second order linear circuits (a)
8. Use op amps to build active filters, summers, inverting and non-inverting amplifiers (e)

Select op amps and passive components appropriate for a design using manufacturer’s data sheets and other technical data. (e)

**Knowledge**

Upon successful completion of the course, the student will be able to explain:

1. The practical limitations of operational amplifiers (a)
2. Phasor representation of sinusoidal signals and introductory Fourier analysis of periodic signals (a)
3. The concepts of complex impedance and admittance. (a)
4. How real passive components differ from their lineal ideal models. (a)

**Attitudes**

During the course, the student must at all times exhibit:

1. Concern for the safety of themselves and others. (f)
2. Efficient use of time and resources. (f)
3. Courtesy to classmates, faculty and staff. (f)
4. Personal integrity. (f)
5. Desire for clear communication. (g)
6. Desire to achieve objectives. (f)

**Topics Covered**

* Fundamental electrical components
* Network analysis
* Thevenin and Norton equivalents
* ACSS analysis, AC power, 3-phase systems
* Systems and frequency
* Operational amplifiers and active filters
* Transient analysis
* Fourier Series/Transforms, Laplace Transforms

**Contribution of Course to meeting ABET Criterion 5:**

This course primarily contributes to Engineering Topics. This is the major course required for the both Electrical Engineering and Computer Engineering degrees. Laboratory team project: selection, research, design, construction, presentation and paper. Right Question Institute based open/ended circuit analysis group studies