ENGT 022: AC CIRCUIT ANALYSIS I

Originator
dcgonzalez

Justification / Rationale
Labor market indicators show that there are jobs available and an advisory committee recommended the course.

Effective Term
Fall 2019

Credit Status
Credit - Degree Applicable

Subject
ENGT - Engineering Technology

Course Number
022

Full Course Title
AC Circuit Analysis I

Short Title
AC CIRCUITS I

Discipline

Disciplines List
Engineering Technology

Modality
Face-to-Face

Catalog Description
This course is an in depth study in Alternating Current (AC) circuit analysis. Topics to be covered include AC generation and transformation, inductance and inductive circuits, capacitance and capacitive circuits, time constants, rectangular and polar notation, AC circuit analysis, resonance, and filters.

Schedule Description
This course is an in depth study in Alternating Current (AC) circuit analysis.
Prerequisite: ENGT 021

Lecture Units
3

Lecture Semester Hours
54

Lab Units
1

Lab Semester Hours
54

In-class Hours
108

Out-of-class Hours
108

Total Course Units
4

Total Semester Hours
216

Prerequisite Course(s)
ENGT 021

Required Text and Other Instructional Materials

Resource Type
Book

Author
Boylestad, Robert L.

Title
Introductory Circuit Analysis

Edition
13

Publisher
Pearson

Year
2015

College Level
Yes

ISBN #
978-0133923605

Resource Type
Manual

Author
Boylestad, Robert L., Kousourou, Gabriel

Title
Laboratory Manual for Introductory Circuit Analysis

Publisher
Pearson

Year
2015

For Text greater than five years old, list rationale:
Lab manual has ISBN: 978-0133923780

Class Size Maximum
30

Entrance Skills
Direct Current Circuit Analysis skills

Prerequisite Course Objectives
ENGT 020-Identify and define electrical terminology concepts, such as, voltage, current, and resistance.
ENGT 020-Evaluate the mathematical concepts used to calculate the electrical expressions.
ENGT 020-Practice electrical safety.

ENGT 020-Calculate voltage, current, resistance using Ohm's Law.
ENGT 021-Identify how resistors, capacitors and inductors can affect a DC circuit.
ENGT 021-Identify series circuits.
ENGT 021-Identify parallel circuits.
ENGT 021-Apply mesh analysis in a direct current circuit to determine the voltages and current in each component.
ENGT 021-Apply nodal analysis in a direct current circuit to determine the voltages and current in each component.
ENGT 021-Analyze the simplification of direct current circuits using Norton's Theorem.
ENGT 021-Analyze the simplification of direct current circuits using Thevenin's Theorem.

Course Content

1. Introduction
   a. DC Circuits review
2. Sinusoidal Alternating Waveforms
   a. AC Voltage characteristics
   b. Frequency Spectrum
   c. Sinusoidal waveform
   d. Phase relations
   e. Average value
3. The basic elements and Phasors
   a. Derivative
   b. Response of basic resistor, inductor and capacitor elements to a sinusoidal voltage or current source.
   c. Frequency response of the basic elements
   d. Average power
   e. Complex numbers
   f. Rectangular form
   g. Polar form
   h. Conversion between forms
   i. Mathematical operations with complex numbers
   j. Phasors
4. Series and parallel AC circuits
   a. Impedance and the Phasor diagram
   b. Series configuration
   c. Voltage divider rule
   d. Frequency response for series AC circuits
   e. Admittance and susceptance
   f. Parallel AC networks
   g. Current divider rule
   h. Frequency response of parallel elements
5. Series-Parallel AC Networks
   a. Ladder networks
   b. Grounding
6. Methods of analysis
   a. Mesh analysis
   b. Nodal analysis
7. Network Theorems
   a. Superposition Theorem
   b. Thevenin's Theorem
   c. Norton's Theorem
   d. Maximum Power Transfer Theorem
   e. Substitution, reciprocity and Millman's Theorem's
8. Power
   a. General Equation
   b. Resistive circuit
   c. Apparent power
   d. Inductive circuit and reactive power
   e. Capacitive circuit

f. The total P, Q and S
g. Effective Resistance

9. Resonance
   a. Series resonant circuit
   b. The Quality factor (Q)
   c. Total Impedance versus frequency
   d. Parallel Resonant circuit
10. Decibels, filters and bode plots
   a. Logarithms
   b. Decibels
   c. Filters
   d. R-C Low-Pass Filter
   e. R-C High-Pass Filter
   f. Pass-band Filters
   g. Stop-band Filters
   h. Double-Tuned Filter
   i. Bode plots
   j. Sketching the Bode response
   k. Crossover networks
11. Pulse waveforms and the R-C response
   a. Ideal versus actual
   b. R-C response to square wave inputs
   c. Oscilloscope attenuator and compensating probe

Lab Content

1. Measuring voltage and time
2. Measuring and calculating phase angles in series RC circuits
3. Measuring and calculating phase angles in series RL circuits
4. Define unit variations in series RC circuit, changing frequency, resistance, capacitance and applied voltage
5. Determining the frequency cutoff in a series RC circuit
6. Determining the frequency cutoff in a series RL circuit

Course Objectives

	Objectives
Objective 1	Define electromagnetic terminology concepts such as voltage, current, resistance, capacitance, inductance and alternating current.
Objective 2	Ability to express values in rectangular and polar notation.
Objective 3	Practice and demonstrate electrical safety.
Objective 4	Obtain electrical measurements using a digital multimeter.

Student Learning Outcomes

	Upon satisfactory completion of this course, students will be able to:
Outcome 1	Explain inductive and capacitive reactance and their source and relation to resonance.
Outcome 2	Describe the interaction between volts, ohms, current and frequency in AC series and parallel circuits.
Outcome 3	Analyze and generate bode-plots from filters.
Outcome 4	Describe the difference between low-pass, pass-band, stop-band and high-pass filters.

Methods of Instruction

Method	Please provide a description or examples of how each instructional method will be used in this course.
Discussion	Students will discuss the material during lecture and lab.
Laboratory	Laboratory will be used to gain a hands-on understanding of the material presented in lecture.

Lecture	Lecture will provide a theoretical introduction and explanation of the material being covered.
Participation	Students will be asked questions during lecture and lab.

Methods of Evaluation

Method	Please provide a description or examples of how each evaluation method will be used in this course.	Type of Assignment
Mid-term and final evaluations	Students will be tested through Canvas to determine their understanding of the material.	In Class Only
Group activity participation/observation	During lab students will work in teams to perform and solve the lab report.	In and Out of Class
Laboratory projects	During Lab students will be expected to discuss with their classmates the purpose of the lab and their findings. Laboratory projects and findings will be evaluated to gain a better understanding for the students' comprehension of the material.	In Class Only
Student participation/contribution	Students will be evaluated by their participation in both lecture and lab.	In Class Only
Tests/Quizzes/Examinations	Quizzes and Exams will include multiple choice questions.	In Class Only
Written homework	Homework will be assigned via Canvas and some questions will require a short written response.	Out of Class Only

Assignments

Other In-class Assignments

1. Take notes
2. Lab work
3. Lab notebook
4. Quizzes
5. Exams
6. Discussion

Other Out-of-class Assignments

1. Reading assignments
2. Writing assignments
3. Lab write ups

Grade Methods

Letter Grade Only

Comparable Transfer Course Information

University System

CSU

Campus

CSU Long Beach

Course Number

ET 252

Course Title

Circuit Analysis II

Catalog Year

2018

Rationale
Study of circuit analysis techniques in AC, including network theorems, mesh and nodal analysis, transients, time domain and phasors, magnetic circuits, sinusoidal and non-sinusoidal wave forms, resonance circuits

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University System
CSU
Campus
California State Polytechnic University, Pomona

Course Number
ETE 103
Course Title
A-C Circuit Analysis

Catalog Year
2018

Rationale
Principles of inductance and magnetism; transients in RL circuits. Phasor analysis in AC circuits; basic AC circuit theorems; transformers

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MIS Course Data

CIP Code
15.0000 - Engineering Technology, General.

TOP Code
092400 - Engineering Technology, General

SAM Code
C - Clearly Occupational

Basic Skills Status
Not Basic Skills

Prior College Level
Not applicable

Cooperative Work Experience
Not a Coop Course

Course Classification Status
Credit Course

Approved Special Class
Not special class

Noncredit Category
Not Applicable, Credit Course

Funding Agency Category
Not Applicable

Program Status
Not program-applicable

Transfer Status
Transferable to CSU only

Allow Audit
No

Repeatability
No

Materials Fee
No

Additional Fees?
No

Files Uploaded

Attach relevant documents (example: Advisory Committee or Department Minutes)
EngrTech Advisory 02-27-18 Minutes and Handouts.pdf

Approvals

Curriculum Committee Approval Date
11/06/2018

Academic Senate Approval Date
11/29/2018

Board of Trustees Approval Date
12/14/2018

Chancellor's Office Approval Date
3/20/2019

Course Control Number
CCC000603617

Programs referencing this course
Engineering Technology AS Degree (http://catalog.collegeofthedesert.eduundefined?key=209)
Electronics Certificate of Achievement (http://catalog.collegeofthedesert.eduundefined?key=210)