GAVILAN COLLEGE
5055 Santa Teresa Blvd
Gilroy, CA 95023

Course Outline

COURSE: ENGR 3 DIVISION: 10 ALSO LISTED AS:

TERM EFFECTIVE: Spring 2022 CURRICULUM APPROVAL DATE: 05/10/2022

SHORT TITLE: ELECTRIC CIRCUIT ANALYSIS

LONG TITLE: Electric Circuit Analysis

Units	Number of Weeks	Type	Contact Hours/Week	Total Contact Hours
4	18	Lecture:	3	54
		Lab:	3	54
		Other:	0	0
		Total:	6	108

COURSE DESCRIPTION:

An introduction to the analysis of electrical circuits. Use of analytical techniques based on the application of circuit laws and network theorems. Analysis of DC and AC circuits containing resistors, capacitors, inductors, dependent sources, operational amplifiers, and/or switches. Natural and forced responses of first and second order RLC circuits; the use of phasors; AC power calculations; power transfer; and energy concepts. The lab portion of the course introduces the construction and measurement of electric circuits. Students learn how to use oscilloscopes, multimeters, function generators, power supplies, and computer simulation tools to study electric circuits. They also build and analyze a variety of circuits, including those with operational amplifiers, and investigate DC, transient, and AC steady state behavior. (C-ID: ENGR 260, ENGR 260L) PREREQUISITE: Math 2C (may be taken concurrently) and PHYS 4B with a grade of 'C' or better.

PREREQUISITES:

(Completion of MATH 2C, as UG, with a grade of C or better., Concurrent OK
AND Completion of PHYS 4B, as UG, with a grade of C or better.)

COREQUISITES:

CREDIT STATUS: D - Credit - Degree Applicable

GRADING MODES

L - Standard Letter Grade

REPEATABILITY: N - Course may not be repeated

SCHEDULE TYPES:

02 - Lecture and/or discussion
03 - Lecture/Laboratory
04 - Laboratory/Studio/Activity
047 - Laboratory - LEH 0.7
05 - Hybrid
71 - Dist. Ed Internet Simultaneous
72 - Dist. Ed Internet Delayed
73 - Dist. Ed Internet Delayed LAB
737 - Dist. Ed Internet LAB-LEH 0.7

STUDENT LEARNING OUTCOMES:

By the end of this course, a student should:

1. Analyze DC circuits to find current, voltage, resistance, power, and/or energy.
2. Analyze circuit diagrams pictorially (draw and label) and by using thorough mathematical solutions.
3. Apply different circuit analysis techniques and demonstrate a process for selecting an appropriate technique for a given problem.
4. Describe and mathematically solve circuits containing two or more operational amplifiers (OP-Amps).
5. Analyze the transient response and complete response for RC, RL, and RLC circuits involving DC sources
6. Describe and solve AC circuits using Phasors.
7. Identify the average and complex power for AC circuits.

COURSE OBJECTIVES:

By the end of this course, a student should:

1. Work effectively in groups by sharing responsibilities and collaborating on findings.
2. Record and document results of lab work using text and graphs.
3. Troubleshoot and repair simple electric circuits.
4. Use a circuit simulation program (PSPICE, MultiSIM) and other computer applications (MATLAB, MS Excel) to predict or describe circuit behavior.
5. Test circuits, analyze data and compare measured performance to theory and simulation.
6. Measure resistance, DC and AC voltages, current, and power, and experimentally verify the results for a variety of electrical circuits.
7. Read circuit schematics and construct linear circuits using resistors, capacitors, inductors, and/or Op-Amps.
8. Access and use the most basic functions of electrical test and measurement equipment including oscilloscopes, multimeters, function generators and power supplies.
9. Calculate average and complex power for AC circuits.
10. Solve AC circuits by using Phasors.
11. Find the transient response and complete response for RC, RL, and RLC circuits involving DC sources.
12. Solve circuits containing two or more Op Amps
13. Apply different circuit analysis techniques and demonstrate a process for selecting an appropriate technique for a given problem.
14. Draw and label circuit diagrams and show thorough mathematical solutions.
15. Analyze DC circuits to find current, voltage, resistance, power, and/or energy.

CONTENT, STUDENT PERFORMANCE OBJECTIVES, OUT-OF-CLASS ASSIGNMENTS

Curriculum Approval Date: 05/10/2022

LECTURE CONTENT:

HOURS 3

Basic Electric Quantities, Circuit Models and Elements

HOURS 3

Ohm’s Law

HOURS 3

Electrical Power and Energy

HOURS 3

Kirchhoff’s Laws

HOURS 3

Equivalent Circuits

HOURS 3

Voltage and Current Division

HOURS 3

Dependent Sources

HOURS 3

Nodal Analysis

HOURS 3

Mesh Analysis

HOURS 3

Thevenin and Norton Equivalent Circuits

HOURS 3

Superposition

HOURS 3

Operational Amplifiers and Analysis using Ideal Models

HOURS 3

Voltage gain and current limitations of non-ideal op amp circuits

HOURS 3

Transient and Complete response of RC, RL, and RLC Circuits

HOURS 3

Sinusoidal steady-state analysis including phasors, complex impedance, and power factor

HOURS 3

Frequency response of first and second order AC circuits

HOURS 3

AC Power including power transfer and power factor correction

HOURS 1

Three phase power

2 Hours

Final Exam

LAB CONTENT:

6 Hours
Basic Laws: Ohms Law, Kirchoff's Laws
Introduction to MATLAB and Lab Safety, Breadboards, Digital Multimeters (DMMs).
6 Hours
Resistors in Series, Resistors in Parallel and Equivalent Resistance
Circuit simulation and Series and Parallel Circuits
6 Hours
Nodal Analysis and Mesh Analysis
6 Hours
Thevenin/Norton Equivalents, Special Thevenin cases, Maximum Power Transfer, Dyodes and Transistors
Diodes and Transistors; Thevenin Equivalences
6 Hours
Operational Amplifier, Inductors and Capacitors
Omp-Amp circuits
6 Hours
1st Order Circuits and 2nd Order Circuits
First Order Circuits and Oscilloscopes; First Order Time Domain Simulation
6 Hours
Sinusoidal Response, Phasors and Inductance
Complex Number, Phasors and Matlab; Phasor Nodal, Mesh and MATLAB
6 Hours
Power and 3-phase circuits
Measuring AC Circuits; Introduction to Micro-controllers
3 Hours
Variable Frequency Response and Resonance
Frequency Selective Circuits
3 Hours
Lab Final Exam

METHODS OF INSTRUCTION:

Instruction will follow a standard lecture/discussion format with an additional laboratory period. Homework will be assigned in order to assure mastery of the concepts covered in class. During laboratory periods students will build electronics circuits and characterize circuit behavior using the appropriate instruments and techniques. In addition, during laboratory periods students will also be required to utilize computer with MATLAB/FreeMat/Octave programming software. FreeMat and Octave are free environments for rapid engineering and scientific prototyping and data processing. They are similar to commercial systems such as MATLAB from Mathworks, and IDL from Research Systems, but is Open Source. Throughout the course, students will be given opportunities to work together on problems given in class and group projects.

OUT OF CLASS ASSIGNMENTS:

Required Outside Hours 54

Assignment Description

Regularly assigned homework that requires students to analyze and study pertinent text material, solved examples and lecture notes.

Required Outside Hours 54

Assignment Description

Regularly assigned homework that requires students to apply the principles and skills covered in class by solving related problems.

METHODS OF EVALUATION:

Evaluation Method

Writing assignments

Evaluation Percent 20

Evaluation Description

Lab Reports

Problem-solving assignments

Evaluation Percent 50

Evaluation Description

Homework Assignments and Take Home projects.

Objective examinations

Evaluation Percent 30

Evaluation Description

In class exams. Each exam will include a portion that is “hands on” (i.e., using lab equipment) and a portion that is “hands off” (i.e., handwritten responses on paper)

REPRESENTATIVE TEXTBOOKS:

Fundamentals of Electric Circuits 7th Edition, Charles Alexander and Matthew Sadiku, McGraw Hill, 2021.

ISBN: 1260226409

Reading level of text, Grade: 13 Grade Verified by: Verified by: David Argudo using MS Word

Online labs developed by California Engineering Liasion Council (CAELC) and the Creating Alternative Leaning Strategies for Transfer Engineering Programs (CALSTEP) project at Ca?ada College: https://canadacollege.edu/nsf-iuse/curriculum.php

ARTICULATION and CERTIFICATE INFORMATION

Associate Degree:

GAV B1, effective 202170

GAV B3, effective 202170

CSU GE:

CSU B1, effective 202170

CSU B3, effective 202170

IGETC:

CSU TRANSFER:

Transferable CSU, effective 202170

UC TRANSFER:

Transferable UC, effective 202170

SUPPLEMENTAL DATA:

Basic Skills: N
Classification: Y
Noncredit Category: Y
Cooperative Education:
Program Status: 1 Program Applicable
Special Class Status: N
CAN: ENGR12
CAN Sequence: XXXXXXXX
CSU Crosswalk Course Department: ENGR
CSU Crosswalk Course Number: 260
Prior to College Level: Y
Non Credit Enhanced Funding: N
Funding Agency Code: Y
In-Service: N
Occupational Course: E
Maximum Hours:
Minimum Hours:
Course Control Number: CCC000628911
Sports/Physical Education Course: N
Taxonomy of Program: 090100