ANTELOPE VALLEY COLLEGE

**Academic Affairs**
**Course Outline of Record**

**Academic Affairs Only**
- ☐ New Course
  - ☐ Effective Date (for articulation )
- COR Revision
- ☐ Pre Req/Advisories
- ☐ Other Changes
- X Update - 3/27/08

**COURSE SUBJECT & NUMBER:** ENGR 230

**COURSE NAME:** Circuit Analysis

**COURSE UNITS:** 4 **COURSE HOURS:** 6 hours weekly

**COURSE REQUISITES:** ***(Follow format of similar courses found in the college catalog.)***
Prerequisite: Completion of MATH 160 and PHYS 120.

**COURSE DESCRIPTION:** ***(Write a short paragraph providing an overview of topics covered. Be sure to identify target audience--transfer, major, GE, degree/certificate, etc. If repeatable, state the number of times at end of description.)***
Ohm's and Kirchoff's Law, Mesh and Nodal analysis, basic network theorems, RL and RC transients, phasors and steady-state sinusoidal analysis, first and second order circuits, current, voltage, and power relationships. [CAN ENGR 6] (CSU, UC, AVC)

**COURSE OBJECTIVES:** ***(Use Bloom's taxonomy to formulate concise, performance-based measurable objectives common to all students. Objectives must be closely aligned with course content, assignments, and methods of evaluation.)***

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

1. Analyze circuit systems using direct application of Kirchoff's Current and Voltage Laws along with Ohm's Law.
2. Interpret analytical circuit results to properly assign power, current, and voltage values to circuit graphical representations.
3. Apply node-voltage analysis techniques to analyze circuit behavior.
4. Apply mesh-current analysis techniques to analyze circuit behavior.
5. Construct parallel and series resistor equivalent circuits.
6. Explain the characteristics of ideal and non-ideal operational amplifiers.
7. Analyze the characteristics of ideal and non-ideal operational amplifier circuits using node-voltage methods.
8. Explain the characteristics of capacitor and inductor circuit elements.
9. Compute initial conditions for current and voltage in first order R-L and R-C capacitor and inductor circuits.
10. Compute time response of current and voltage in first order R-L and R-C capacitor and inductor circuits.
11. Compute initial conditions for current and voltage in second order RLC circuits.
12. Compute time response of current and voltage in second order RLC circuits.
13. Use PSpice tools to create and analyze circuit models.
14. Use PSpice tools to design and analyze resistive circuit systems.

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**COURSE CONTENT:** ***(Enter course content in terms of specific topics or a specific body of knowledge that each instructor must cover. Put topics in outline form with major and minor headings. Each instructor must cover all material listed below.)***

I. Electric Circuit Variables
   a. Current
   b. voltage
   c. resistance
   d. sources
   e. energy
   f. power

II. Circuits
   a. Resistive

III. Analysis of resistive circuits
   a. Kirchoff's laws
   b. Ohm's law
   c. Mesh analysis
   d. Nodal analysis
   e. Superposition

IV. Circuit theorems
   a. Norton
   b. Thevenin

V. Operational amplifiers

VI. Energy storage elements
   a. Capacitor
   b. Inductors

VII. The complete response of RL and RC circuits
   a. Natural response
   b. Driven response

VIII. Second order circuits (RCL)

IX. Sinusoidal steady state analysis
   a. Complete response
   b. Phasors

X. AC steady state power

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**TYPICAL HOMEWORK ASSIGNMENTS: (Do not include in-class work, quizzes, or tests)**
***This information is necessary for all credit courses. Assignments should be closely related to course objectives, content, and methods of evaluation. (See sample of a "Model Outline" in the AP&P Standards & Practices Handbook.) Include a range of assignments (minimum of three) from which faculty may choose when designing their syllabus.***

**1.** ***Describe nature and frequency of typical reading assignments if applicable; note if any are required:***
Reading may include approximately 30 pages from the textbook per week.

**2.** ***Describe nature and frequency of typical writing assignments if applicable; note if any are required:***
Writing will include, but not limited to, laboratory reports in technical writing style.

**3.** ***Describe nature and frequency of typical computational assignments if applicable; note if any are required:***
Weekly use of college algebra and trigonometry when analyzing electric circuits.
Weekly use of integral and differential calculus when analyzing first and second order electric circuits.

**4.** ***Describe other types of homework assignments that students may be asked to complete (oral presentations; special projects; visual/performing arts; etc); note if any are required:***
Students may be required to complete a semester long design and analysis project.

***5. Describe those critical thinking skills that are derived from assignments listed above; be sure that they reflect course objectives.***

Students will:
Learn to analyze complex circuits by reducing them to smaller manageable ones.
Use information from basic physical principles to design circuits (transfer of knowledge between separate domains).
Develop problem solving skills in a hands-on environment.

**6.** ***For categories 1-4 above, describe the estimated time per week it would take a student to complete homework assignments.*** *Title 5 requires a minimum 2:1 ratio as follows: 1 hr. lecture = 2 hrs. homework; 2 hrs. lecture = 4 hrs. homework; 3 hours lecture = 6 hours homework etc. For example: reading —2 hours; writing —3 hours; etc.*

***Reading Assignments***: 2 hours of reading per week

***Writing Assignments***:

***Computational Assignments***:

***Other Assignments***: Typically 7 hours of outside work per week.

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**METHODS OF INSTRUCTION:** ***(Methods must be consistent with content and appropriate to objectives; state in terms of what instructor will be doing in order to present course content to students: for example, lecture, demonstration, present audio/visual materials; facilitate group work, etc. Do not list specific instructional equipment.)***

Lectures
Demonstrations
Collaborative problem solving
Hands-on activities
Computer based simulations.

**METHODS OF EVALUATION:** ***(These must be clearly related to course objectives and reflect course content and assignments in order to comply with Title 5 requirements. Describe what instructor will be looking for when evaluating various assignments and tests in order to determine whether students have met course objectives. Grades must be based on demonstrated proficiency in subject matter and determined, where appropriate, by essays, objective and essay tests, research papers or projects, problem solving exercises, or skills' demonstrations.)***

Midterms.
Weekly homework assignments.
Weekly reading quizzes.
Design projects.
Assignments will be evaluated based on the correctness of answers or successful operation of the design project.

**Suggested Texts or Other Instructional Materials**
***(list several when possible; include title, author, publisher, date, and latest edition.)***
Title: Introduction To Electric Circuits
Author: Richard C. Dorf & James A Svoboda
Ed. 6th (2006)
Publisher: John Wiley and Sons