Big Bend COMMUNITY COLLEGE

MASTER COURSE OUTLINE
Prepared By: Julie Chang   Date: Sep 2017

COURSE TITLE
Electrical Circuits

GENERAL COURSE INFORMATION

Dept.: ENGR&	Course Num: 204	(Formerly:)
CIP Code: 14.1001	Intent Code:	Program Code:
Credits: 5		
Total Contact Hrs Per Qtr.: 55		
Lecture Hrs: 55	Lab Hrs: 0	Other Hrs: 0
Distribution Designation: Natural Science NS		

COURSE DESCRIPTION (as it will appear in the catalog)
This course introduces electrical circuit concepts and mathematical models to analyze electrical circuits and systems. The behaviors of circuit components including resistors, sources, capacitors, inductors and operational amplifiers will be examined. The analytic solutions of mathematical models will be calculated and presented in terms of voltage, current and electrical power. Fundamentals of electrical power generation, transmission, analysis and calculation will also be covered.

PREREQUISITES
MATH& 152, PHYS& 223, or instructor permission. Corequisites: Differential Equations or instructor permission.

TEXTBOOK GUIDELINES
Open source textbook, lecture videos, and free resources will be posted online (Canvas) for 24/7 access. Access to the internet will be required. Other reference books will be available at library, e.g. (1) *Electrical Circuit*s, by James W. Nilsson, (2) *Fundamentals of Electric Circuits* by Charles K. Alexander.

COURSE LEARNING OUTCOMES
Upon successful completion of the course, students should be able to demonstrate the following knowledge or skills:
1. Apply Ohm's law to circuit problems.
2. Identify linear systems and represent those systems in schematic form.
3. Apply Kirchhoff's Current and Voltage Laws to circuit problems.
4. Conduct circuit simplification using series and parallel equivalents models; analyze circuits using Thevenin and Norton Theorems.
5. Identify and model first and second order electric systems involving capacitors and inductors.
6. Perform node and loop analyses and compute voltage and current using matrix.
7. Predict the transient behaviors of first and second order circuits.
8. Analyze circuit performance involving Operational Amplifiers, apply Operational Amplifiers in filter designs.
9. Apply the concepts of phasors and impedance to steady-state sinusoidal circuits.

10. Describe the difference among Real Power, Reactive Power, and Apparent Power; calculate the sinusoidal steady-state power using Power Triangle.

INSTITUTIONAL OUTCOMES

None

COURSE CONTENT OUTLINE

I. Circuit variables and elements: voltage, current, power and energy.
II. Resistance and Ohm's Law, Kirchhoff's Voltage and Current Laws. Analysis of circuits with independent and dependent voltage and current sources. .
III. Simple resistive circuits. Series, parallel resistors and their equivalent circuits. Voltage and current dividers. Measurement of voltage, current and resistance. Wheatstone bridge, Delta-to-Wye equivalent circuits.
IV. Techniques of circuit analysis. Node voltage method, mesh current method, source transformations, Thevenin and Norton equivalents, and Superposition Principle. Maximum power transfer.
V. The operational amplifiers (op-amps): inverting amplifiers, non-inverting amplifiers, summing amplifiers, and difference amplifiers. The characteristics of ideal op-amps. The terminal voltages and currents of an ideal op-amp. Exam the non-ideal op-amps.
VI. Capacitance, inductance, and mutual inductance. The capacitor and inductor in series and parallel configurations.
VII. Response of 1st order RL and RC circuits: Natural and Step responses of RL and RC circuits. Series and parallel configurations of RL and RC circuits. General solutions of RL and RC circuits. The integrating amplifier.
VIII. Natural and step responses of RLC circuits. Natural responses of parallel/series RLC circuits. Step responses of parallel/series RLC circuits.
IX. Introduction to complex number, complex variable, and complex analysis. Apply the concepts of phasors and impedance to steady-state sinusoidal circuits.
X. Real Power, Reactive Power, and Apparent Power. Calculation of sinusoidal steady-state power using the Power Triangle.

DEPARTMENTAL GUIDELINES *(optional)*

PO5 should be assessed: Students will be able to solve problems by gathering, interpreting, combining and/or applying information from multiple sources.

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DIVISION CHAIR APPROVAL **DATE**