RARITAN VALLEY COMMUNITY COLLEGE
ACADEMIC COURSE OUTLINE

ENGR 111 - INTRODUCTION TO CIRCUIT ANALYSIS

I. Basic Course Information

A. Course Number and Title: ENGR-111 Introduction to Circuit Analysis

B. New or Modified Course: Modified

C. Date of Proposal: Fall 2020

D. Effective Term: Fall 2021

E. Sponsoring Department: Science & Engineering

F. Semester Credit Hours: 4

G. Weekly Contact Hours: Lecture: 3
Laboratory: 2
Out of class student work per week: 7

H. Prerequisites: PHYS 151 Engineering Physics II or PHYS 102 General Physics II
MATH 152 Calculus II

I. Laboratory Fees: No

J. Name and Telephone Number or E-Mail Address of Department Chair and Dean at time of approval: Chair: Dr. Ed Carr, edward.carr@raritanval.edu, Dean: Dr. Sarah Imbriglio, Sarah.Imbriglio@raritanval.edu

II. Catalog Description

Prerequisites: PHYS 151 Engineering Physics II or PHYS 102 General Physics II
MATH 152 Calculus II

This is an introductory course in circuit theory for engineering majors. It includes introduction to D.C. and A.C. electrical principles with stress on different circuit analysis methods. Use of Ohm's law, Kirchoff' s laws, network theorems for resistive, capacitive and inductive networks - Phasors and Phasor diagrams for AC circuits introduced with real and reactive power and maximum power transfer studies, operational amplifiers, and filter analysis. Appropriate experiments are run concurrently with lectures.

III. Statement of Course Need

A. This is a standard course usually taken in the second year of an engineering program. It is required for several engineering majors and is needed to ensure the credibility and articulation of our engineering program.

B. The course has a laboratory component, as is commonly found within engineering programs. The laboratory offers the students the ability to work with equipment that they will see in further studies, and in their career work. The laboratory exercises are closely matched with the lecture material to both reinforce, and offer additional learning opportunities.

C. This course generally transfers as an engineering program requirement.

IV. Place of Course in College Curriculum

A. This course is a Free Elective
B. This course meets a program requirement for the Engineering Science AS degree and the Mechanical Engineering Technology AS degree.
C. To see course transferability: a) for New Jersey schools, go to the NJ Transfer website, www.njtransfer.org; b) for all other colleges and universities, go to the individual websites.

V. Outline of Course Content

Topics to be Covered:

A. Voltage, current, power, ideal sources and resistance.
B. Ohm's law, Kirchoff' s laws; Series, parallel and series parallel circuits; voltage and current dividers.
C. Nodal analysis and mesh analysis.
D. Superposition; Thevenin - Norton equivalent circuits; Source transformation; Maximum power transfer.
E. Introduction to Operational Amplifiers
F. Introduction to circuit simulation
G. Inductance, capacitance; Natural responses of RL and RC circuits; Response of RLC circuits to sinusoidal forcing function.
H. AC circuit analysis; Phasors - R,L, C, A,Y for series - parallel circuits; Superposition, Thevenin - Norton equivalent circuits; Mesh and Nodal analysis; Source transformation; Phasor diagrams.
G. Real and reactive power; Power factor; RMS values of periodic wave forms; Maximum power transfer.
H. Wye- Delta transformation
I. Filter analysis, frequency response and transfer functions

Laboratory Experiments:

A. Prelab on laboratory safety procedures; Meters; Meter accuracy and loading – Resistors and color code
B. Basic D.C. measurements - Series & Parallel D.C. circuits. Application of Ohm's laws and
C. Methods of analysis - Mesh and Nodal analysis
D. Network theorems, (Thevenin - Norton)
E. Superposition Principle
F. Operational Amplifiers (DC)
G. Prelab on Oscilloscope including the theory of frequency, Voltage and phase measurements
E. Methods of measuring frequency and phase using the oscilloscope. RLC Circuits
F. Basic A.C. measurements - Series, Parallel A.C circuits. Application of Kirchhoff' s laws on A.C circuits
J. Series - Parallel Resonance

VI. General Education and Course Learning Outcomes

A. General Education Learning Outcomes:

At the completion of the course, students will be able to:

1. Develop an understanding of electrical engineering by utilizing fundamental physical concepts and diverse applications. (NJ-GE 3, 4).
2. Analyze laboratory data and circuit schematics to solve electrical circuit problems (NJ-GE 2)

B. Course Learning Outcomes:

At the completion of the course, students will be able to:

1. analyze and solve electrical circuit problems systematically and logically
2. design and construct electrical circuits in the laboratory
3. test circuits for proper function

C. Assessment Instruments

1. laboratory products and reports
2. midterm exams
3. quizzes
4. homework
5. final exam

VII. Grade Determinants

Factors that may enter into the determination of the final grade:

A. laboratory products and reports
B. midterm exams
C. quizzes
D. weekly homework
E. final exam

Primary formats, modes, and methods for teaching and learning that may be used in the course:

A. lecture/discussion
B. small-group laboratory work (calculations and analysis)
C. laboratory (physically build and measure circuits)
D. computer simulation
E. independent study

VIII. Texts and Materials

Suggested Textbooks and materials:

A. "*Circuits"*, Ulaby, F.T., and Maharbiz, M.M. latest edition, National Technology and Science Press
B. "Experiments in Circuit Analysis", Boylestead/Kousourou
C. LTspice (free circuit simulation program)
D. web sources

Please Note: The course outline is intended only as a guide to course content and resources. Do not purchase textbooks based on this outline. The RVCC Bookstore is the sole resource for the most up-to-date information about textbooks.)

IX. Resources

Required resources include: (Required resources are available for 8 lab stations)

A. Laboratory equipment:
    a. Power supplies
    b. Oscilloscope
    c. Digital Multi-Meter
    d. Function generator
    e. Prototype boards
B. Laboratory supplies:
    a. Resistors
    b. Capacitors,
    c. Potentiometers
    d. Operational amplifiers
    e. Potentiometers

X. Honors Option

Not applicable.