MOHAWK VALLEY COMMUNITY COLLEGE

UTICA, NEW YORK

COURSE OUTLINE

1. CATALOG DESCRIPTION

ES291 Electrical Circuits I C3, P-2, CR-4

CRN # 15158/ 10456

This course presents a calculus based introduction to linear circuit analysis for Engineering Science majors. This course heavily focuses on Electrical quantities, Applied laws & principles, and Electrical system modeling using DC & AC circuits.

Items like Resistive circuits, Voltage & current divider circuits, Nodal & Mesh Analysis techniques, Thevenin, Norton, superposition, and source transformation, as well as Delta- Wye equivalent circuits and phasor analysis are also covered. Balanced three-phase and transformer circuits are also presented.

Laboratory exposure & exercises are provided. Some computer based simulation tools are also introduced for comparative analysis.

Corequisites: MA253 Analytical Geometry and Calculus 3

PH26 Engineering Physics 2

1. COURSE OBJECTIVES

This is first of a two-course sequence of Electrical circuit analysis for engineering science students.

1. DETAILED COURSE OUTLINE

WEEK TOPICS

1. 1 Electrical Concepts & quantities. Define and Explain

Charge, Current, Voltage, Resistance, Power, Energy

Voltage Source, current source, Controlled sources

2 2. Laws and Theorems- Application to DC Circuits

Circuit Elements

1. Ohm’s Law
2. Kirchhoff’s Laws

3-4 3. Simple Resistive Circuits Series and Parallel connected Resistors

1. Resistors in Series/ Parallel
2. Voltage divider and Current Divider Circuits
3. The Wheatstone Bridge
4. Delta Wye Equivalents circuits

5-6 4. Techniques of Circuit Analysis

1. Node-Voltage Method
2. Mesh-Current Method
3. Super Node/ Super Mesh
4. Thevenin’s & Norton’s Equivalents
5. Superposition Theorem
6. Maximum Power Transfer

7 Tentative Mid Term

8-9 6. Inductance and Capacitance (AC Circuits)

a. Inductors in Series and Parallel

b. Capacitors in series and Parallel

c. Mutual Inductance

10-11 7. d. Natural Response of RL circuit

e. Natural Response of RC circuits

f. Step Response of RL & RC circuits

12 8 Natural and Step Responses of Parallel and Series RLC circuits

1. 9 Relationship Among Exponential, Sinusoidal, and dc

Waveforms

1. Review of complex numbers
2. Exponential Notation
3. Rectangular Notation
4. Phasors

14 9. Steady State Analysis- Sinusoidal Excitation

a. Phasor Diagrams

b. Power

i) Apparent, Real and Reactive

ii) Power Triangle

iii) Power Factor

iv) Power Factor Correction

v) Maximum Power Transfer Theorem

15 10. Sinusoidal Steady State Power Calculation

1. Instantaneous Power
2. Average & Reactive Power
3. Rms value
4. Complex Power

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LABORATORY EXERIMENTS TOPICS

1. Series-Parallel DC Circuits
2. Ladders and Bridges
3. Potentiometers and Rheostats
4. Superposition Theorem
5. Thevenin's Theorem
6. Maximum Power Transfer
7. Capacitors and Inductors
8. Mutual Inductance
9. Phasors
10. Oscilloscope Orientation