AMERICAN UNIVERSITY
OF CYPRUS

Course Code MH241	**Course Name** Circuit Analysis	**ECTS Credit** 7.5
Pre-Requisite CS102	**Course Type** Major Elective	**Language of Instruction** English
Year of Study 2^{nd} /4^{th}	**Level of Course** BSc/1st Cycle	**Mode of Delivery** On Campus

Course Objectives:

The main objectives of the course are to:

• Further enhance skills in analyzing and designing dc networks and in particular second-order transient circuits as well as op-amp circuits.

• Develop a thorough understanding of the analysis techniques used in ac networks and their application to real-world problems.

• Introduce the student to the systematic application of Phasor and Laplace transform in circuit analysis.

• Develop an overall understanding of concepts like frequency response of basic R, L and C elements, resonance and filters.

• Elaborate on ac power, three-phase circuits, mutual inductance and transformers.

• Apply computer techniques to the analysis of electrical/electronic systems.

Learning Outcomes

After completion of the course students are expected to be able to:

• Determine the natural and step response of RLC series and parallel dc networks

• Apply Complex Number theory and Phasors to perform sinusoidal steady-state analysis using network theorems and other circuit techniques.

• Identify and explain important power concepts like Average, Reactive, and Complex power as well as Power Factor and calculate all forms of power in ac circuits.

• Analyze balanced three-phase circuits and perform power calculations.

• Explain the physical principle of Mutual Inductance and analyze circuits containing linear and ideal transformers using phasor methods.

• Apply Laplace Transform and inverse Laplace Transform as well as the Initial and Final Value theorem.

• Analyze a circuit in the s-domain.

• Explain the concept of resonance and design frequency selective circuits.

Teaching Methodology:

Lectures 42 hours

Labs 30 hours

Course Content:

• The Natural and Step Response of a series and parallel R-L-C circuit.

• Sinusoidal steady-state analysis (The sinusoidal source and response, Frequency domain representation of passive circuit elements, Series, parallel and D-Y simplification of impedances and admittances, KCL and KVL, Methods of Analysis and Network Theorems in the frequency domain, Phasor Diagrams.

• Sinusoidal steady-state power calculations (Instantaneous, average, reactive, apparent and complex power, Root-mean-square (rms) values and power calculations, the power triangle and power-factor-correction, Maximum power transfer).

• Balanced and unbalanced three-phase circuits (Balanced three-phase sources, Analysis of the Y-Y, Y-Δ, Δ-Y, and Δ-Δ connections, Power calculations in balanced and unbalanced three-phase circuits).

• Mutual inductance (Development of self-and mutual inductance in stationary magnetic circuits, The Dot Convention, Energy calculations, The linear and ideal transformer models, Equivalent circuits for magnetically-coupled coils).

• The Laplace Transform (Definition of the Laplace transform, Functional and operational transforms, Inverse Laplace transformation via partial fraction expansion, Poles and zeros of F(s), Initial-and final-value theorems).

• The Laplace transform in electric circuit analysis in the s domain, The transfer function and its importance, The transfer function and its use for sinusoidal steady state response of AC circuits).

• Introduction to Frequency Selective Circuits (Low Pass Filters, High Pass Filters, Band Pass Filters, Band Reject Filters).

Assessment Methods:

Final Exam

Mid-term/Lab Exam

Required Textbooks/Reading:

Title	**Author(s)**	**Publisher**	**Year**
Electric Circuits Prentice Hall	James W. Nilson, Susan A. Riedel		2008
Introductory Circuit Analysis Prentice Hall	Robert L. Boylestad		2007