UNIVERSITY of NICOSIA

Course Syllabus

Course Code	Course Title	ECTS Credits
ECE-102	Electric Circuits II	6
Prerequisites	**Department**	**Semester**
ECE-100	Engineering	Fall, Spring
Type of Course	**Field**	**Language of Instruction**
Required	Engineering	English
Level of Course	**Lecturer(s)**	**Year of Study**
1st Cycle	Andreas Serghiou	1st
Mode of Delivery	**Work Placement**	**Corequisites**
Face-to-face	N/A	MATH-191

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.

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 (s-domain representation of passive circuit elements, 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).

Learning Activities and Teaching Methods:

Lectures, in-class design examples.

Assessment Methods:

Homework, mid-term exam, final exam.

Required Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Electric Circuits	James W. Nilson, Susan A. Riedel	Prentice Hall	2008	0131989251

Recommended Textbooks / Readings:

Title	Author(s)	Publisher	Year	ISBN
Introductory Circuit Analysis	Robert L. Boylestad	Prentice Hall	2007	0131988263
Basic Engineering Circuits Analysis	David J. Irwin, Mark R. Nelms	Wiley	2008	9780470128695