AEEE222 - Circuit Analysis I

Course Title	Circuit Analysis I with Lab				
Course Code	AEEE222				
Course Type	Compulsory				
Level	BSc (Level 1)				
Year / Semester	1/2				
Teacher's Name	Dr Marios Lestas / Dr Alexis Polycarpou				
ECTS	6	Lectures / week	3	Laboratories/week	1
Course Purpose	The aim of the course is to familiarize the students with the basic concepts and principles of electrical circuit analysis in order to identify and implement their basic components and arrangements. In particular, the course aims to equip students with the necessary analysis tools to analyze circuits comprising of interconnected basic electrical elements. The course is supported with Lab Experiments which aim to familiarize students with the basic electrical elements and measuring devices and assist in validating the theoretical laws with practical measurements.				
Learning Outcomes	By the end of the course, students must be able to: 1. Develop competence in the use of Kirchoff's voltage law (KVL) and Kirchoff's current law (KVL) in simple resistive circuits. 2. Use Kirchoff's voltage law (KVL) and Kirchoff's current law (KVL) to determine currents voltages and power in complex resistive circuits and justify the need of structured methods in analysing such circuits. 3. Demonstrate competences in systematic analysis of linear resistive circuits using Mesh, Node Voltage method, Source Transformations and the principle of Superposition. 4. Compare the various methods and develop competence in choosing the most appropriate and efficient method to analyze a specific circuit. 5. Employ the Thevenin and Norton equivalent circuit to analyse complex resistive circuits. 6. Calculate maximum power transfer to the load. 7. Apply ac circuit analysis theorems and methods in simple R-L, R-C, and RLC circuits.				
Prerequisites	None	Corequisites	None		
Course Content	**Introduction:** Systems of units. Scientific notation. Current, voltage, resistance and their units. Voltage and current sources. **Fundamental Laws:** Ohms Law. Series and parallel combinations of				

	resistors. Kirchoff's voltage and current laws. Voltage and current divider rules. **Circuit analysis methods**: Mesh Analysis, Node Voltage, Source Transformations. Thevenin's and Norton's theorem, Maximum Power Transfer, Superposition theorem. **Introduction to the concept of impedance:** Introduction to AC circuit analysis. Simple R-L, R-C, and RLC circuits. Bridges. **Laboratory work:** Individual and small group experiments are performed by building simple resistive circuits on breadboards, aiming at validating the analytical methods and theorems taught in lectures with experimental data derived from specific interconnections of the basic electrical elements. The outputs are obtained using a digital multi-meter and the results are also verified using the PC circuit simulation software.
Teaching Methodology	Students are taught the course through lectures (3 hours per week) in classrooms or lectures theatres, by means of traditional tools or using computer demonstration. Auditory exercises, where examples regarding matter represented at the lectures, are solved and further, questions related to particular open-ended topic issues are compiled by the students and answered, during the lecture or assigned as homework. Topic notes are compiled by students, during the lecture which serve to cover the main issues under consideration and can also be downloaded from the e-learning platform or the lecturer's webpage. Students are also advised to use the subject's textbook or reference books for further reading and practice in solving related exercises. Tutorial problems are also submitted as homework and these are solved during lectures or privately during lecturer's office hours. Furthermore, design projects may be assigned to the students, where literature search is encouraged to identify a specific problem related to some issue, gather relevant scientific information about how others have addressed the problem, implement to implement the design and report the results in written or orally. Where appropriate, taught material as well as examples and design problems are drawn from the recent research activities of the lecturer or other faculty members. Laboratory experiments are carried out in small groups and lab reports are required two weeks after the laboratory class resulting in a cumulative mark.
Bibliography	**(a) <u>Textbook:</u>** • J. Nilsson, S. A. Riedel, **Introductory Circuits for Electrical and Computer Engineering**, Prentice Hall, 11th Edition, 2018. **(b) <u>References:</u>** • R. Boylestad, **Introductory Circuit Analysis**, 13th edition, Pearson, 2015. • R. C. Dorf, J. A. Suoboda, **Introduction to Electric Circuits**, 9th Edition, John Wiley & Sons, 2013.
Assessment	The Students are assessed via continuous assessment throughout the duration of the Semester, which forms the Coursework grade and the final

	written exam. The coursework and the final exam grades are weighted **40%** and **60%**, respectively, and compose the final grade of the course. Various approaches are used for the continuous assessment of the students, such as mid-term written exam, oral exam, quizzes, design assignments, design projects and laboratory experiments. The assessment weight, date and time of each type of continuous assessment is being set at the beginning of the semester via the course outline. An indicative weighted continuous assessment of the course is shown below: • Assignments 10% • Homework 10% • Mid-Term written exams 30% • Design Project 20% • Laboratory Work 20% • Quizzes 10% Students are prepared for final exam, by revision on the matter taught, problem solving and concept testing and are also trained to be able to deal with time constrains and revision timetable. The criteria considered for the assessment of each type of the continuous assessment and the final exam of the course are: (i) the comprehension of the fundamental concepts and theory of each topic, (ii) the application of the theory in solving related problems and (iii) the ability to apply the above knowledge in more complex design problems. The above criteria are weighted 30%, 40% and 30%, respectively. The final assessment of the students is formative and summative and is assured to comply with the subject's expected learning outcomes and the quality of the course
Language	**English**