AEEE323 - Problem solving for Electrical Engineering using MATLAB and Simulink

Course Title	Problem solving for Electrical Engineering using MATLAB and Simulink				
Course Code	AEEE323				
Course Type	Compulsory				
Level	BSc (1st Cycle)				
Year / Semester	3rd / 2nd				
Teacher's Name	Associate Prof Symeon Nikolaou				
ECTS	6	Lectures / week	3	Laboratories/week	2
Course Purpose	The aim of the course is to familiarize the students with the Matlab environment and its use as a high level programming language and as a collection of software toolkits, especially the ones developed for electrical engineering problem solving. Considering the students' background they are expected to efficiently and effectively use Matlab environment to solve problems originating from Electric Circuits and from Digital Signal Processing and also exploit in data analysis, organization and graphic illustration. For the analysis of the transient and steady state response of randomly excited R-L-C networks students are introduced to the graphic environment of Simulink.				
Learning Outcomes	By the end of the course, students must be able to: 1. Apply basic programming principles in Matlab environment. 2. Become able to use Matlab software to perform high complexity and time consuming mathematical calculations. 3. Create plots and use m files for input and output parameters during the development of Matlab funtions. 4. Analyze DC and AC circuits using Matlab. 5. Apply the concepts of signal sampling and discretization in real signals. 6. Use Laplace and Fourier transform in signal and system analysis to solve problems for which analytical solutions are not possible. 7. Use computational tools to apply the concepts of optimization for simple problems. 8. Exploit Simulink for building block models of simple electrical engineering systems.				
Prerequisites	AEEE223, AEEE310, AEEE238	Corequisites	None		
Course Content	• Matlab fundamentals: Input Output, program flow, built-in and user defined functions, graphics manipulation, working with matrices and vectors, exporting Matlab data to Excel. • DC/AC current circuits and transient analysis: Direct current ckts, alternating current ckts, transient analysis. Use of basic circuit theorems to analyse linear				

	problems with many unknowns. Use of Node Voltage and Mesh Current method to extract linear equations in canonical form to solve for the unknowns. Use higher order ODEs for the analysis of complex R-L-C networks. • Laplace Transform: Direct Laplace transform, Laplace transform in AC ckts, inverse Laplace transform using build-in functions • Fourier Transform: Convolution, Fourier transform in signal processing, Fourier series, complex exponential Fourier series, discrete time representation of continuous-time signals • Problem Solving: Use of Matlab for electrical engineering and general problem solving • Simulink: Creating and running a model, typical building blocks, constructing subsystems using built-in blocks. •**Laboratory work:** Individual and small group experiments performed on PCs using the licensed software. Experiments include 1) Use of Matlab as calculator, 2) Graphics and image processing, 3) Problem solving using logical operators conditional statements and loops 4) DC/AC circuit analysis 5) Laplace/Fourier Transformation, 6) Simulink
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. Topic notes are compiled by students, during the lecture can also be downloaded from 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 Laboratory experiments are carried out in small groups and lab reports are required two weeks after the laboratory class resulting in a cumulative mark. Students who fail the lab are marked as Incomplete and they are required to complete the laboratory work to pass the course. A written lab assessment is required for the successful completion of the lab obligations.
Bibliography	**(a) Textbooks:** • M. Kalechman, "Practical Matlab Applications for Engineers", CRC Press, 2009 • J. Michael Fitzpatrick and John D. Crocetti, "Introduction to Programming with Matlab", 2011 **(b) References:** • Steven C. Charpa, "Applied Numerical Methods with Matlab for Engineers and Scientists", McGraw Hill, 2012 • Miza Kalechman, "Practical Matlab Applications for Engineers", CRC Press, 2007 • Simulink Simulation and Model Based Design, Mathworks, 2005

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, quizzes, and laboratory assessment based on laboratory experiments and reports. 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: • Mid-Term written exams 40% • Laboratory Assessment 40% • Laboratory reports 20% 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 20%, 60% and 20%, 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**