Course unit title:	COMPUTATIONAL METHODS AND ALGORITHMS FOR ELECTRICAL ENGINEERS		
Course unit code:	AEEE309		
Type of course unit:	Compulsory		
Level of course unit:	Bachelor (1st Cycle)		
Year of study:	3		
Semester when the unit is delivered:	5 (Fall)		
Number of ECTS credits allocated :	6		
Name of lecturer(s):	Dr. Christos Themistos		
Learning outcomes of the course unit:	1. Understand the concepts of interpolation for curve fitting and apply this techniques to obtain the interpolation polynomials for given data sets and various functions 2. Apply numerical integration techniques for the solutions of integral functions and calculate the approximate solutions of first and second order differential equations. 3. Describe the electromagnetic field evolution in terms of Maxwell's equation and the various approaches used for its numerical analysis. 4. Comprehend the principles of the Finite Element Method and apply the above techniques to formulate engineering problems 5. Apply Finite Difference approach to formulate Engineering problems in the frequency and time domain.		
Mode of delivery:	Face-to-face		
Prerequisites:	None	Co-requisites:	None
Recommended optional program components:	None		
Course contents:	• Application of interpolation methods for curve fitting. • Use of numerical approaches for integration and differentiation. • Review of Ritz and Galerkin methods for formulating variational problems. Introduction to Finite Element Analysis for Electromagnetic field problems. Discretisation of variational formulations generated using Maxwell's equations. Development of discretised variational formulation with the use of shape functions. Assembly of finite element matrices and standard eigenvalue problem formulation. • Understanding of explicit time-dependent partial differential equations solution methods. Introduction of basic finite difference techniques for the solution of Electromagnetic field problems in the time domain. Finite Difference Approximation of the Transmission Line Equations. Application of the Yee-algorithm for the solution of time dependent Maxwell equations for vector electromagnetic fields		
Recommended			

and/or required reading:	
Textbooks:	• S.C Chapra and R.P. Canale, “Numerical Methods for Engineeris”, Mc Graw Hill, Sixth Ed., 2010.
References:	• B.M.A. Rahman and A. Agrawal, “Finite element Modeling Methods for Photonics, Artech House, 2013 • A. Taflove and S.C. Hagness, “Computational Electrodynamics: The Finite-Difference Time-Domain Method, Artech House, 3rd Ed., 2005.
Planned learning activities and teaching methods:	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 and laboratory work (hour per week) in the Computer Lab. 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 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. Further literature search is encouraged by assigning students to identify a specific problem related to some issue, gather relevant scientific information about how others have addressed the problem and report this information in written or orally. 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 are assessed continuously and their knowledge is checked through tests with their assessment weight, date and time being set at the beginning of the semester via the course outline. 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 constraints and revision timetable.

	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.
Assessment methods and criteria:	• Assignments 05% • Tests: 20% • Laboratory Work: 15% • Final Exam 60%
Language of instruction:	English
Work placement(s):	No