



University of Nicosia, Cyprus

<b>Course Code</b> ECE-290	<b>Course Title</b> Numerical Methods Using MATLAB	<b>ECTS Credits</b> 6
<b>Department</b> Engineering	<b>Semester</b> Fall	<b>Prerequisites</b> MATH-191, MATH-280
<b>Type of Course</b> Required	<b>Field</b> Engineering	<b>Language of Instruction</b> English
<b>Level of Course</b> 1 <sup>st</sup> Cycle	<b>Year of Study</b> 2 <sup>nd</sup>	<b>Lecturer(s)</b> Dr Ioannis Kyriakides
<b>Mode of Delivery</b> Face-to-face	<b>Work Placement</b> N/A	<b>Co-requisites</b> None

**Objectives of the Course:**

The main objectives of the course are to:

- Introduce the most essential numerical methods and computational techniques
- Provide understanding of basic mathematical concepts and principles which, along with numerical methods, can be used for the solution of problems in science and engineering
- Provide understanding of computational issues and commonly-used terms such as round-off error, degree of accuracy, rate of convergence, machine precision, etc.
- Introduce MATLAB programming for the implementation of numerical algorithms for the solution of problems in science and engineering
- Develop computationally efficient and accurate algorithms for the solutions of problems

**Learning Outcomes:**

After completion of the course students are expected to:

- Write software codes in MATLAB
- Use MATLAB as a programming tool to solve numerical problems in science and engineering and to graphically display the obtained solution
- Solve linear systems of equations using direct and iterative methods
- Solve numerically for the roots of higher-order polynomials
- Use interpolation techniques for curve-fitting of data
- Evaluate numerical differentiation and integration using different methods
- Solve boundary value problems using finite difference and finite element methods

**Course Contents:**

- Introduction to MATLAB programming including arrays and matrix operations, files and built-in functions, logical statements, loops, operators, data structures,

- plotting, etc.
- Solution of linear systems of equations using direct and iterative methods
- Root finding of higher-order polynomials
- Interpolation and curve fitting using polynomials, sinusoidal functions, Lagrange functions, and splines
- Numerical integration using rectangular and trapezoidal rules, Simpson's rule, and Gauss quadrature
- Numerical differentiation using backward, forward and central difference
- Solution of boundary value problems using finite difference and finite element methods

**Learning Activities and Teaching Methods:**

Lectures, in-class examples, exercises, computer assignments

**Assessment Methods:**

Homework, exams, Project, final exam.

**Required Textbooks/Reading:**

Authors	Title	Publisher	Year	ISBN
Amos Gilat and Vish Subramaniam	Numerical Methods for Engineers and Scientists: An Introduction with Applications Using MATLAB	John Wiley & Sons	2008	9780471734406

**Recommended Textbooks/Reading:**

Authors	Title	Publisher	Year	ISBN
Steven C. Chapra and Raymond P. Canale	Numerical Methods for Engineers	McGraw Hill	2006	007-124429-8
William J. Palm III	Introduction to MATLAB 7 for Engineers	McGraw Hill	2004	007-254818-5