



University of Nicosia, Cyprus

Course Code MATH-140	Course Title Mathematics with Computers	ECTS Credits 8
Department Mathematics	Semester Spring	Prerequisites MATH-190
Type of Course Elective	Field Mathematics	Language of Instruction English
Level of Course 1 st Cycle	Year of Study 1 st	Lecturer(s) Dr. N. Papanicolaou
Mode of Delivery Face-to-face	Work Placement N/A	Co-requisites MATH-191

Objectives of the Course:

The main objectives of the course are to:

- Introduce students to the use of Mathematical Software
- Prepare Students for Numerical Analysis courses
- Discuss the concept of computational error
- Familiarize students with Computer Algebra Software
- Demonstrate the use of a CAS in performing operations and solving Calculus and Linear Algebra problems
- Cover plots of symbolically defined functions and datafiles
- Familiarize students with the basics of MATLAB
- Cover topics in Programming with Matlab
- Present applications of Matlab to Linear Algebra
- Introduce the symbolic Math toolbox

Learning Outcomes:

After completing the course students are expected to be able to:

- Use Computer Algebra Software and MATLAB to perform operations.
- Use a CAS to solve problems in Calculus and Linear Algebra
- Apply the techniques and computational skills acquired in more advanced courses such as Differential Equations and Numerical Analysis
- Write and debug programs in Matlab

Course Contents:

1. Introduction:
 - Computer Basics
 - Overview of the use of computers in Mathematics
 - Computational error
2. Computer Algebra Software: (or Matlab's symbolic Math toolbox)
 - Basic Symbolic Computations
 - Representation of numbers and accuracy
 - Built-in functions
 - User-defined functions and more advanced elements. Calculus Applications (e.g. limits, difference quotients)
 - Representation of Sequences and sums. Applications (e.g. Definite Integrals and Riemann Sums)
 - Plots and Graphics
 - Matrices and arrays.
3. Matlab
 - Basic Elements. The Matlab command line
 - Defining and initializing variables. Incrementing and Decrementing
 - Operators, constants and types
 - Vectors and Matrices (Initialization, column and row vectors, operations, the inverse of a matrix)
 - Matlab Programming
 - o Matlab Scripts
 - o Input and Output. Reading from and writing to files.
 - o User Defined Functions
 - o Relational Expressions
 - o Selection Statements (The If-Else and Switch statements)
 - o Loops and Iterations(The For and While loops, nested loops)
 - o Modular Programs and Subfunctions
 - o Errors and debugging
 - Plotting with Matlab

Learning Activities and Teaching Methods:

Lectures and Computational/Programming Assignments

Assessment Methods:

1 Mid-Term Exam; Computational Assignments, Final Exam.

Required Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
A. Gilat	MATLAB: An Introduction with Applications	Wiley 4 th Edn.	2010	9780470873731
C.K. Cheung, G.E. Keough, R.H. Gross, C. Landraitis	Getting Started with Mathematica	Wiley 3 rd Edn.	2009	9780470456873

Recommended Textbooks/Reading:

Authors	Title	Publisher	Year	ISBN
S. Attaway	Matlab: A Practical Introduction to Programming and Problem Solving	Butterworth-Heinemann 2 nd Edn.	2011	978-0123850812
T.A. Davis	MATLAB Primer	CRC Press 8 th Edn.	2010	978-1439828625