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| Course Unit | Informatics | | Field of study | Informatics | |
| Bachelor in | Civil Engineering | | School | School of Technology and Management | |
| Academic Year | 2022/2023 | Year of study | 1 | Level | 1-1 |

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| | | ECTS credits: 6.0 |
| Type | Semestral | Semester: 1 |
| | | Code: 9089-322-1105-00-22 |

| Workload (hours) | 162 | Contact hours | T | - | TP | - | PL | 60 | TC | - | S | - | E | - | OT | - | O | - |
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T - Lectures; TP - Lectures and problem-solving; PL - Problem-solving, project or laboratory; TC - Fieldwork; S - Seminar; E - Placement; OT - Tutorial; O - Other

**Name(s) of lecturer(s):** Isabel Maria Lopes

## Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:
1. Recognizing the need and advantages of automatic data processing
2. Use tools for processing and analysis of large volumes of data
3. Use an interactive tool of high performance oriented to execution of tasks that involve numerical calculations
4. Acquire fundamental knowledge to solve problems using the programming
5. Define structures and models of basic data to support the modelling of problems in the context of experimental sciences
6. Take advantage of the evaluation of expressions entered in the MATLAB command window
7. Conceive algorithms for scientific program solving
8. Encode routines and small programs in the integrated development environment of the MATLAB

## Prerequisites

Before the course unit the learner is expected to be able to:
Have a basic understanding of computer operation and its potential

## Course contents

Introduction to spreadsheets. Data introduction and editing. Spreadsheet formatting. Charts. Formulas and functions. Introduction to MATLAB. Arrays. Plotting. M-Files. Operators. Branching statements and loops.

## Course contents (extended version)

1. EXCEL – Spreadsheet
   - Definition
   - Features
   - Areas of application
   - Basic concepts: book, sheet and cell
   - Structure of the Microsoft Excel spreadsheet
   - Main features of the working environment
   - Taskbar and ribbon tabs
   - Features and basic operations
2. EXCEL – Formatting
   - Text, numbers and date/time
   - Alignment, borders and lines, controlling the text direction and union of cells
   - Fonts
   - Borders, background color and patterns
   - Changing columns widths and row heights
   - Fit the cell to content and hiding rows and columms
   - Automatic and conditional formatting
3. EXCEL – Charts
   - Creating a chart
   - Chart elements and chart types
   - Chart options
   - Chart formatting
4. EXCEL – Formulas and functions
   - Arithmetic, relational and logical operators
   - Entering, editing and copying formulas
   - Using relative, absolute, and mixed references
   - Referencing cells outside the worksheet
   - Inserting functions into formulas
   - Categories of functions: date and time, math and trigonometry, statistical, and logical
   - Categories of functions: lookup and reference, database and text
5. MATLAB – Introduction
   - MATLAB presentation
   - The MATLAB environment
   - Commands and expressions
   - Variables
   - Elementary mathematical built-in functions
   - List of elementary built-in functions
6. MATLAB – Arrays
   - Notion of vector, matrix and array
   - Definition of row and column vectors
   - Matrix concept
   - Definition of matrices
   - Matrix sizes
   - Indexing of vectors and matrices
   - Operations on vectors and matrices
   - Functions for manipulating matrices
   - Multidimensional arrays
   - List of built-in functions for matrix calculation
7. MATLAB – Plotting
   - Introduction to plotting
   - Bi-Dimensional plots
   - Three-Dimensional plots
   - Multiple plots
   - Special plots: histograms, bar, slice and functions
   - Annotation and formatting plots

## Course contents (extended version)

- Tools for plot editing
- Save, open, print and export
- List of built-in functions for plots manipulation

8. MATLAB – M-Files
- Introduction to M-Files
- Input and output data
- Scripts
- Functions: basic structure, the parameter list of variables and subfunctions

9. MATLAB - Operators
- Arithmetic opeartors
- Relational operators
- Logical operators
- Operator precedence
- Test functions
- List of built-in functions for operators

10. MATLAB – Branching statements and loops
- The if construct
- The switch-case construct
- The for loop
- The while loop
- The break statement
- The continue statement
- Summary of MATLAB language constructs

## Recommended reading

1. "Fundamental do Excel 2010", M. J. Sousa, FCA –Editora de Informática, 2011
2. "Microsoft Office Excel 2010 Bible", J. Walkenbach, Wiley Publishing, 2010
3. "MATLAB 7&6 Curso Completo", V. Morais, C. Vieira, FCA–Editora de Informática, 2006
4. "MATLAB Programming for Engineers", S. J. Chapman, 4th Ed. , Thomson Learning, 2008
5. "MatLab – Textos de Apoio e Caderno de Exercícios", L. Alves, I. Lopes, 2011

## Teaching and learning methods

The course unit will be taught using lectures exposing theoretical concepts, practice classes for problem solving, and teacher-oriented self learning.

## Assessment methods

1. Alternative 1 - (Regular, Student Worker) (Final, Supplementary)
- Intermediate Written Test - 30% (Excel component)
- Final Written Exam - 70% (MatLab component)
2. Alternative 2 - (Regular, Student Worker) (Supplementary, Special)
- Final Written Exam - 100% (Includes one or more supplementary exercises intended to replace the continuous assays)

## Language of instruction

Portuguese

## Electronic validation

| Isabel Maria Lopes | José Luís Padrão Exposto | António Miguel Verdelho Paula | Paulo Alexandre Vara Alves |
|---|---|---|---|
| 04-10-2022 | 10-10-2022 | 11-10-2022 | 04-11-2022 |