## 1. GENERAL

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|---|---|---|---|
| **SCHOOL** | ENGINEERING | | |
| **DEPARTMENT** | PRODUCT AND SYSTEMS DESIGN ENGINEERING | | |
| **LEVEL OF STUDIES** | **UNDERGRADUATE** | | |
| **COURSE CODE** | **2101** | **SEMESTER** | **3rd** |
| **COURSE TITLE** | **ALGORITHMS AND DATA STRUCTURES** | | |

| **INDEPENDENT TEACHING ACTIVITIES** *if credits are awarded for separate components of the course, e.g. lectures, laboratory exercises, etc. If the credits are awarded for the whole of the course, give the weekly teaching hours and the total credits* | **WEEKLY TEACHING HOURS** | **CREDITS** |
|---|---|---|
| Lectures | **3** | **6** |
| Laboratory | | |
| *Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).* | | |

| | |
|---|---|
| **COURSE TYPE** *general background, special background, specialised general knowledge, skills development* | Special background |
| **PREREQUISITE COURSES:** | |
| **LANGUAGE OF INSTRUCTION and EXAMINATIONS:** | GREEK/ENGLISH |
| **COURSE DELIVERED TO ERASMUS STUDENTS** | YES |
| **MODULE WEB PAGE (URL)** | https://eclass.uowm.gr/courses/MRE232 |

## 2. LEARNING OUTCOMES

**Learning outcomes**

An algorithm is a well-designed computational process that processes incoming data and produces results corresponding to solution of a particular problem. The aim of this course is to introduce students to the understanding of the complexity of algorithms in terms of processing speed and computational resource requirements (memory), to provide them with basic knowledge about the design data structures so that they can design algorithms that manage computer memory efficiently, and also to provide them with basic knowledge of techniques for designing efficient computational processes by studying classical problem solving algorithms.

Upon successful completion of the course, the student should be able to:

- Evaluate the performance of an algorithm in terms of its execution time
- Estimate the requirements of an algorithm in computing power
- Estimate the requirements of an algorithm for memory on a computer
- Design appropriate data structures for an algorithm
- Optimize the computational process in an algorithm

- Implement algorithms with an object-oriented approach.

**General Skills**

This course aims to give students the necessary theoretical background for the analysis of algorithms, basic knowledge for the development of algorithms, as well as expertise for object-oriented implementation of algorithms.

### 3. COURSE CONTENTS

- Algorithm analysis
- Asymptotic behavior of algorithms
- Data structures (arrays, stacks, queues, binary trees, graphs)
- Sorting algorithms
- The divide and conquer technique
- Recursion
- Searching in tree structures
- The greedy method
- Dynamic programming

### 4. TEACHING METHODS - ASSESSMENT

| | |
|---|---|
| **MODE OFDELIVERY** | 1. THEORY<br>In class, face to face |
| **USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY** | ● Use of appropriate software<br>● Video and slide presentations via projector<br>● Support of teaching process via the electronic platform e-class |
| **TEACHING METHODS** | |
| **ASSESSMENT METHODS** | 1. (60%) Final written exam which includes:<br>i. Short-answer questions<br>ii. Multiple choice questions<br>iii. Problem solving<br>2. (40%) Homework |

| *Activity* | *Semester workload* |
|---|---|
| Lectures | 50 |
| Homework | 50 |
| Non-directed study | 50 |
| Course total | **150** |

### 5. ATTACHED

*- Suggested bibliography:*


- **Τσίχλας, Κ., Γούναρης, Α., Μανωλόπουλος, Ι., 2015, Σχεδίαση και ανάλυση αλγορίθμων. [ηλεκτρ. βιβλ.] Αθήνα:Σύνδεσμος Ελληνικών Ακαδημαϊκών Βιβλιοθηκών. Διαθέσιμο στο: http://hdl.handle.net/11419/4005, ISBN: 978-9606034657**

- **Michael T. Goodrich, Roberto Tamassia, and Michael H. Goldwasser, 2013, Data Structures & Algorithms in Python, John Wiley & Sons, Inc., ISBN: 978-1118290279**

- **Μαγκούτης Κ, Νικολάου Χ, 2015, Εισαγωγή στον αντικειμενοστραφή**

**προγραμματισμό με Python, Αθήνα:Σύνδεσμος Ελληνικών Ακαδημαϊκών Βιβλιοθηκών. Διαθέσιμο στο: http://hdl.handle.net/11419/1708, ISBN: 978-9606031014**