

## COURSE OUTLINE

### (1) GENERAL

|                                                                                                                                                                                                                                                                |                                                |                              |                |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|------------------------------|----------------|
| <b>SCHOOL</b>                                                                                                                                                                                                                                                  | School of Engineering                          |                              |                |
| <b>ACADEMIC UNIT</b>                                                                                                                                                                                                                                           | Department of Informatics and Computer Science |                              |                |
| <b>LEVEL OF STUDIES</b>                                                                                                                                                                                                                                        | Undergraduate                                  |                              |                |
| <b>COURSE CODE</b>                                                                                                                                                                                                                                             |                                                | <b>SEMESTER</b>              | <b>2</b>       |
| <b>COURSE TITLE</b>                                                                                                                                                                                                                                            | Design and Analysis of Algorithms              |                              |                |
| <b>INDEPENDENT TEACHING ACTIVITIES</b><br>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 |                                                | <b>WEEKLY TEACHING HOURS</b> | <b>CREDITS</b> |
| Lectures                                                                                                                                                                                                                                                       |                                                | 2                            |                |
| Class exercises                                                                                                                                                                                                                                                |                                                | 2                            |                |
|                                                                                                                                                                                                                                                                |                                                |                              |                |
| Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).                                                                                                                                              |                                                | 4                            | 5              |
| <b>COURSE TYPE</b><br>general background,<br>special background, specialised<br>general knowledge, skills<br>development                                                                                                                                       | Background                                     |                              |                |
| <b>PREREQUISITE COURSES:</b>                                                                                                                                                                                                                                   |                                                |                              |                |
| <b>LANGUAGE OF INSTRUCTION and EXAMINATIONS:</b>                                                                                                                                                                                                               | Greek                                          |                              |                |
| <b>IS THE COURSE OFFERED TO ERASMUS STUDENTS</b>                                                                                                                                                                                                               | Yes (English)                                  |                              |                |
| <b>COURSE WEBSITE (URL)</b>                                                                                                                                                                                                                                    |                                                |                              |                |

### (2) LEARNING OUTCOMES

#### Learning outcomes

The course learning outcomes, specific knowledge, skills and competences of an appropriate level, which the students will acquire with the successful completion of the course are described. Consult Appendix A

- Description of the level of learning outcomes for each qualifications cycle, according to the Qualifications Framework of the European Higher Education Area
- Descriptors for Levels 6, 7 & 8 of the European Qualifications Framework for Lifelong Learning and Appendix B
- Guidelines for writing Learning Outcomes

The students will be familiarized with the basic principles and concepts of algorithmic design and analysis of algorithms. Upon the successful completion of the course the students will be able to

- describe algorithms in pseudocode,
- derive algorithms for solving computational problems,
- apply algorithmic techniques,
- evaluate algorithmic performance using mathematical tools.

The knowledge and capabilities acquired are fundamental for attending a big number of courses in the semesters that follow.

#### General Competences

Taking into consideration the general competences that the degree-holder must acquire (as these appear in the Diploma Supplement and appear below), at which of the following does the course aim?

Search for, analysis and synthesis of data and information, with the use of the necessary technology  
Adapting to new situations

Project planning and management  
Respect for difference and multiculturalism  
Respect for the natural environment  
Showing social, professional and ethical

|                                             |                                                     |
|---------------------------------------------|-----------------------------------------------------|
| Decision-making                             | responsibility and sensitivity to gender issues     |
| Working independently                       | Criticism and self-criticism                        |
| Team work                                   | Production of free, creative and inductive thinking |
| Working in an international environment     | .....                                               |
| Working in an interdisciplinary environment | Others...                                           |
| Production of new research ideas            | .....                                               |

- Search, analysis and synthesis of data and information, using the necessary technologies
- Work in an interdisciplinary environment
- Generating new research ideas
- Promotion of free, creative and inductive thinking

### (3) SYLLABUS

- The Concept of Algorithm.
- Representation of algorithms with pseudo-language (Basic elements, assignment, value input and output, selection structures, iteration structures, algorithm call by algorithm).
- Introductory concepts of algorithm complexity analysis. Asymptotic symbolisms. Classes of functions  $O$ ,  $\Omega$ ,  $\Theta$ ,  $o$ ,  $\omega$  notation Classification of Functions.
- Basic algorithm design techniques and application to solving problems.
- Simple iterative algorithms (array manipulation, array lookup, sorting, string searching, etc.). Repetitive analysis algorithms.
- Analysis of recursive functions
- Recursive algorithms, divide-and-conquer algorithms (binary search, merge sort, quick sort, etc.).
- Processing sequential files.

**(4) TEACHING and LEARNING METHODS - EVALUATION**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                        |                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|--------------------------|
| <b>DELIVERY</b><br>Face-to-face, Distance learning, etc.                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Lectures (live)                                                                                                        |                          |
| <b>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</b><br><br>Use of ICT in teaching, laboratory education, communication with students                                                                                                                                                                                                                                                                                                                                                                                   | Eclass platform for communicating with the students and publishing slides, lecture notes and exercises with solutions. |                          |
| <b>TEACHING METHODS</b><br>The manner and methods of teaching are described in detail. Lectures, seminars, laboratory practice, fieldwork, study and analysis of bibliography, tutorials, placements, clinical practice, art workshop, interactive teaching, educational visits, project, essay writing, artistic creativity, etc.<br><br>The student's study hours for each learning activity are given as well as the hours of non-directed study according to the principles of the ECTS                                | <b>Activity</b>                                                                                                        | <b>Semester workload</b> |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Lectures                                                                                                               | 26                       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Class exercises                                                                                                        | 26                       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Home study                                                                                                             | 73                       |
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Course total                                                                                                           | 125                      |
| <b>STUDENT PERFORMANCE EVALUATION</b><br>Description of the evaluation procedure<br><br>Language of evaluation, methods of evaluation, summative or conclusive, multiple choice questionnaires, short-answer questions, open-ended questions, problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other<br><br>Specifically-defined evaluation criteria are given, and if and where they are accessible to students. | Final exam                                                                                                             |                          |

**(5) ATTACHED BIBLIOGRAPHY**

- Suggested bibliography:

1. Cormen, Leiserson, Rivest, Stein, Introduction to Algorithms, MIT Press
2. Levitin Anany, Introduction to the design and analysis of algorithms, 3rd Edition, Pearson Publishers.

- Related academic journals:

Journal of Algorithms  
Journal of Discrete Algorithms  
Algorithmica