# COURSE OUTLINE

## 1. GENERAL

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|---|---|---|---|
| **SCHOOL** | NATURAL SCIENCES | | |
| **DEPARTMENT** | MATHEMATICS | | |
| **LEVEL OF COURSE** | UNDERGRADUATE | | |
| **COURSE CODE** | MAT_IC437 | **SEMESTER OF STUDIES** | 7th |
| **COURSE TITLE** | OPERATING SYSTEMS | | |

| **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* | **TEACHING HOURS PER WEEK** | **ECTS CREDITS** |
|---|---|---|
| Lectures and Tutorials | 4 | 6 |
| | | |
| | | |
| *Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).* | | |

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| **COURSE TYPE** *general background, special background, specialised general knowledge, skills development* | Elective course |
| **PREREQUISITE COURSES:** | Recommended prerequisite knowledge: INTRODUCTION TO COMPUTERS AND PROGRAMMING WITH FORTAN, PROGRAMMING WITH PYTHON |
| **TEACHING AND ASSESSMENT LANGUAGE:** | Greek |
| **THE COURSE IS OFFERED TO ERASMUS STUDENTS** | No |
| **COURSE WEBPAGE (URL)** | https://eclass.math.upatras.gr/courses/MATHDEP287/ |
| | |

## 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*

With this course a student majoring in Mathematics in effect makes a tour to the main concepts of the architecture of a computing system and of an operating system (OS). In particular:

- Understands the concept of interrupts, of a process (compared to a program) and the way processes are supported in an OS.
- Becomes aware of the problems that arise from concurrent asynchronous processes, and the difficulties in solving them and learns some mutual exclusion techniques.
- Learns about how the main memory is organized and understands the reasons of introducing virtual memory, paging and segmentation
- Applies the concepts introduced in the class in the computer laboratory, using as case study the Linux operating system.

**General Abilities**

*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?*

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|---|---|
| *Search for, analysis and synthesis of data and information, with the use of the necessary technology* | *Project planning and management* |
| *Adapting to new situations* | *Respect for difference and multiculturalism* |
| *Decision-making* | *Respect for the natural environment* |
| *Working independently* | *Showing social, professional and ethical responsibility and sensitivity to gender issues* |
| *Team work* | *Criticism and self-criticism* |
| *Working in an international environment* | *Production of free, creative and inductive thinking* |
| *Working in an interdisciplinary environment* | *Others…* |
| *Production of new research ideas* | |

- Adaptation to new situations.
- Work in an interdisciplinary environment.
- Excercise of criticism and self-criticism.
- Promotion of free, creative and inductive thinking.

## 3. COURSE CONTENT

Introduction. Historical facts. Single and multitasking computing systems, single and multiuser systems. Interactive systems. Basic computer architecture facts. Interrupt handling. Functions of an operating systems. The process concept. Process handling. Process scheduling algorithms. Asynchronous concurrent processes. Dekker's algorithm. Semaphors, monitors. Problems on mutual exclusion. Deadlocks, Banker's algorithm. Memory management. Secondary memory and disk scheduling algorithms. Main memory. Program allocation techniques, contiguous/non-contiguous allocation. Virtual memory. Non-contiguous memory allocation, paging and segmentation. Virtual memory management. Table lookaside buffer. Page replacement techniques. The working set. Case study: the Linux system and laboratory practice on the concepts developed in class.

## 4. TEACHING AND LEARNING METHODS - ASSESSMENT

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|---|---|
| **TEACHING METHOD**<br>*Face-to-face, Distance learning, etc.* | Lectures (face to face) |
| **USE OF INFORMATION AND COMMUNICATION TECHNOLOGIES**<br>*Use of ICT in teaching, laboratory education, communication with students* | Supporting learning through the online platform *eClass,* University of Patras. |
| **TEACHING ORGANIZATION**<br>*The manner and methods of teaching are described in detail.*<br><br>*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* | |
| **STUDENT ASSESSEMNT**<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.* | **Assessment Language:** Greek<br>**Assessment Language for Erasmus students:** ---<br><br>**Assessment methods:**<br>✓ Final exam: 80%<br>✓ Laboratory performance: 20%<br><br>Minimum passing grade: 5<br>Μαximum passing grade: 10 |

| ***Activity*** | ***Semester workload*** |
|---|---|
| Class Lectures | 26 |
| Laboratory training | 26 |
| | |
| Unattended study | 45 |
| Unattended study in the laboratory | 50 |
| | |
| Final exam | 3 |
| | |
| | |
| ***Total number of hours for the Course (25 hours of work-load per ECTS credit)*** | ***150*** |

## 5. RECOMMENDED LITERATURE

(*in Greek*)


- Tanenbaum Andrew S. *Σύγχρονα Λειτουργικά Συστήματα*. 3η Έκδοση, Εκδόσεις Κλειδάριθμος, 2009.
- Silberschatz Abraham, Galvin Peter B. and Gagne Greg. *Λειτουργικά Συστήματα*. 2η Έκδοση, Εκδόσεις Ίων, 2009.