COURSE OUTLINE

(1) GENERAL

SCHOOL	School of Engineering		
ACADEMIC UNIT	Informatics and Computer Engineering		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE		**SEMESTER**	3rd
COURSE TITLE	Operating Systems I		
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**
		4	5
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	General background, Specialised general knowledge		
PREREQUISITE COURSES:			
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	Greek		
IS THE COURSE OFFERED TO ERASMUS STUDENTS	Yes (in English)		
COURSE WEBSITE (URL)	https://eclass.uniwa.gr/courses/CS121/		

(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 course aims to present the basic concepts, principles and components of operating systems so that students understand the technology behind them and how to efficiently manage the resources of a computer system. A more specific goal is to provide students with the necessary knowledge regarding the architectural structure and the basic design issues of operating systems so that they can understand, classify and analyze the most specific techniques and methods through which the efficient and transparent support of the various types of services they provide to the users of a (multi-process) computer system becomes possible. Also, the application of the relevant techniques and services in practice.

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

- Describe the basic functions of an operating system.
- Recognize the fundamental role of operating systems in the performance of modern applications and systems, through the increased capabilities of simultaneous execution of multiple processes and concurrent servicing multiple users that they offer.
- Describe the different ways of scheduling processes in the CPU of a computer system and explain their differences and their advantages / disadvantages.
- Explain the problem of mutual exclusion and effectively use the basic synchronization and process communication mechanisms of a multi-process operating system
- Describe the mode of operation and distinguish the advantages and disadvantages of the different methods of organizing and managing the main memory of a computer system.
- Explain how the virtual memory organization works and distinguish the different page

replacement algorithms used in modern operating systems.
- Recognize the role and importance of the structures and services of a file system in the operation and performance of a computer system.
- Describe the operation and management of the most basic input/output devices of a computer system and to delve into the scheduling methods of the most important of these devices, the disks of a system.
- Understand, use, manage and make extensive use in practice of the mechanisms, tools and services offered by one of the most popular and widely used real operating systems (unix/linux).

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

- Autonomous work
- Team work
- Adaptation to new situations
- Work in an interdisciplinary environment
- Promotion of free, creative and inductive thinking
- Search for, analysis and synthesis of data and information, using the necessary technologies

(3) SYLLABUS

Theory:

- Introduction to operating systems (definition, history, basic concepts, structure, layering, categories, etc.).
- Process communication and synchronization (definition, race conditions, critical sections, mutual exclusion, locking mechanisms, queues, semaphores, monitors, etc.).
- CPU management (scheduling requirements and criteria, process scheduling algorithms for batch processing systems and interactive systems, performance measures, etc.).
- Thread management (differences between threads and processes, support of user-level and kernel-level threads, scheduling, synchronization and communication, libraries, etc.)
- Memory management (swapping, physical memory organization, variable partitions, virtual memory, paging, segmentation, address translation, page replacement algorithms, hybrid schemes).
- Basic principles of input-output management (device types, scheduling algorithms, etc.) and file systems.
- Case studies (the support of the above concepts and mechanisms in modern operating systems such as Windows and Unix/linux).

Lab:

Unix/Linux: installation, architecture, user commands, filters, shell programming, system administration, basic security and protection mechanisms, writing and using simple and complex scripts, programming with the awk language. Exercises simulating key concepts. Introduction to the programming of concurrent processes (child processes, etc.).

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY Face-to-face, Distance learning, etc.	Face-to-face. Use of distance learning (if required)
USE OF INFORMATION AND	Use of ICT in Course Teaching and Laboratory Education,

COMMUNICATIONS TECHNOLOGY Use of ICT in teaching, laboratory education, communication with students	Use of ICT in Communication with Students Post course material on the University's e-learning platform (e-class). Use of email and e-class in communication with students.
TEACHING METHODS 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. 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	<table><tr><th>Activity</th><th>Semester workload</th></tr><tr><td>Lectures</td><td>26</td></tr><tr><td>Problem Solving in Class</td><td>13</td></tr><tr><td>Laboratory Education</td><td>13</td></tr><tr><td>Lab exercises</td><td>25</td></tr><tr><td>Non-guided study</td><td>48</td></tr><tr><td>Course total</td><td>125</td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table>
STUDENT PERFORMANCE EVALUATION Description of the evaluation procedure 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 Specifically-defined evaluation criteria are given, and if and where they are accessible to students.	Final Grade = (70% * Grade of the Theory_Part) + (30% * Grade of the Laboratory Part) *Evaluation Process of Theory Part*: Final written exam at the end of the semester *Evaluation Process of Laboratory Part*: Preparation of laboratory exercises / assignments and oral or written examination The evaluation process is disclosed to the students in class and online, via e-class.

(5) ATTACHED BIBLIOGRAPHY

1. Silberschatz A., Galvin P., Gagne G., *Operating Systems Concepts*, 10th edition, Wiley, 2018.
2. Stallings W., *Operating Systems: Internals and Design Principles*, 9th edition, Pearson, 2017.
3. Tanenbaum A., Bos H., *Modern Operating Systems*, 4th edition, Pearson, 2015.
4. Κάβουρας Ι., *Λειτουργικά Συστήματα*, 5η έκδοση, Εκδόσεις Κλειδάριθμος, 2000 (in greek).
5. Gary Nutt, Operating Systems, 3rd edition, Addison-Wesley, 2003.
6. Robert Love, *Linux Kernel Development*, 3rd edition, Addison-Wesley, 2010.
7. Robert Love, *Linux System Programming*, 2nd edition, O'Reilly Media, 2013.
8. Kernighan B., Pike R., *The Unix Programming Environment*, Prentice Hall, 1985.
9. Glass G., Ables K., *Unix for Programmers and Users*, Prentice Hall, 1998.
10. Stevens W.R., *Unix Network Programming*, Vol. 2: Interprocess Communications, 2nd Edition, Prentice Hall, 2000.