COURSE OUTLINE

GENERAL

<table>
<thead>
<tr>
<th>SCHOOL</th>
<th>Engineering</th>
</tr>
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<tbody>
<tr>
<td>ACADEMIC UNIT</td>
<td>Department of Computer Engineering and Informatics</td>
</tr>
<tr>
<td>LEVEL OF STUDIES</td>
<td>Undergraduate</td>
</tr>
<tr>
<td>COURSE CODE</td>
<td>CEID_NE4547</td>
</tr>
<tr>
<td>SEMESTER</td>
<td>Winter</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>Computer Systems Performance Analysis</td>
</tr>
</tbody>
</table>

INDEPENDENT TEACHING ACTIVITIES

<table>
<thead>
<tr>
<th>Activity</th>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures, Tutorials, Laboratory</td>
<td>2 (L), 2 (T), 1 (L)</td>
<td>5</td>
</tr>
</tbody>
</table>

Add rows if necessary. The organisation of teaching and the teaching methods used are described in detail at (d).

COURSE TYPE

Skills development,

general background,
special background, specialised general
knowledge, skills development

PREREQUISITE COURSES:

Recommended prerequisite knowledge: Good familiarity with the courses “Probability and Basic Statistics” (NY204), “Introduction to Computers and Programming” (NY131), “Linear Algebra” (NY110) or equivalents.

LANGUAGE OF INSTRUCTION and EXAMINATIONS:

Greek. The course may be offered in English for Erasmus students.

IS THE COURSE OFFERED TO ERASMUS STUDENTS:

Yes

COURSE WEBSITE (URL)

https://eclass.upatras.gr/courses/CEID1093/

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

Upon conclusion of the course, the students ought to be able to:

1. Understand the importance of performance modeling and evaluation of modern information systems.
2. Choose the appropriate evaluation techniques, performance metrics and workloads for their information systems performance studies.
3. Configure and efficiently use existing performance evaluation tools, such as Benchmarks and Monitors.
4. Plan and manage the capacity of information systems to meet predefined performance requirements.
5. Define the optimal number of experiments and parameters required for the efficient study of existing systems or their simulation models.
6. Know the usefulness, the limitations and the scope of Queueing Theory, the basic analytical methodology for studying the performance of information systems.
7. Produce Queueing Theory models that correspond to the information systems they are studying.
8. Solve basic models of Queueing Theory, such as M/M/1, M/M/m and M/M/1/K.
9. Solve Queueing Network models, open and closed.
10. Know the usefulness, the limitations and the scope of Simulation Models in studying information systems.
11. Create software to implement Simulators.
12. Choose from existing and create their own empirical probability distributions and random number generators for their Simulators.
13. Analyze the results from performing Simulation experiments.

**Upon conclusion of the course, the students are expected to have the following skills:**

1. Have gained a broader Engineering view in information systems.
2. Applying methods and tools of the Operations Research sector, both in information and in other systems.
3. Designing and configuring information systems to meet predefined performance requirements.
4. Designing, solving and implementing models for the performance study of information systems, either by experimental devices, by analytical techniques or by simulation.
5. Analyzing and presenting the results of their study.

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

**SYLLABUS**

1. Introduction
2. Methodology for the performance study of information systems
3. Selecting evaluation techniques
4. Selecting performance metrics
5. Commonly used performance metrics
6. Workloads
7. Benchmarks and Monitors
8. Capacity planning and management of information systems
9. Design of study experiments
10. Analytical performance models and techniques
11. Simple queueing theory models
12. Queueing networks models
13. Efficient algorithms for solving queueing network models
14. Simulation of information systems
15. Applications on computer systems and networks
### DELIVERY

Ex cathedra.

### USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY

Use of ICT in teaching, laboratory education, communication with students.

The slides of the course and additional supplementary material are freely available from the course’s website. Communication with students is done through a dedicated e-forum.

### 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>
<thead>
<tr>
<th>Activity</th>
<th>Semester workload</th>
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<tbody>
<tr>
<td>Lectures</td>
<td>2x13 = 26</td>
</tr>
<tr>
<td>Tutorials (exercises)</td>
<td>2x13 = 26</td>
</tr>
<tr>
<td>Laboratory exercises</td>
<td>1x13 = 13</td>
</tr>
<tr>
<td>Individual study, preparation and problem solving</td>
<td>3x13 = 39</td>
</tr>
<tr>
<td>Weekend study</td>
<td>2x13 = 26</td>
</tr>
<tr>
<td>Study during the 3 “empty weeks” (2 weeks of vacation and 1 week of exam preparation)</td>
<td>4x3 = 12</td>
</tr>
<tr>
<td>Course total</td>
<td>129</td>
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</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.

- The language of instruction and examination is Greek. Special provisions (lecture notes and examinations in English) can be made for foreign students.
- The final grade is based 100% on performance on the final examination. The evaluation criteria are posted on the course website.
- The final examination is written, of graded difficulty, and may include: developing and solving complex problems, questions for short answers, judgment questions.
- During the course, students may also be assigned theoretical and programmatic exercises, aiming at familiarizing them with the analytical models of Queueing Theory and Simulation techniques.

### ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
  - John Garofalakis, “Evaluation Techniques for Computer Systems” (in Greek), Course Notes, 2010, University of Patras
- Related academic journals:

This is an introductory course, hence there is no systematic use of articles from the scientific literature.