COURSE OUTLINE

(1) GENERAL

<table>
<thead>
<tr>
<th>SCHOOL</th>
<th>POLYTECHNIC SCHOOL OF UNIVERSITY OF PATRAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACADEMIC UNIT</td>
<td>COMPUTER ENGINEERING &amp; INFORMATICS</td>
</tr>
<tr>
<td>LEVEL OF STUDIES</td>
<td>UNDERGRADUATE</td>
</tr>
<tr>
<td>COURSE CODE</td>
<td>CEID_NE5017</td>
</tr>
<tr>
<td>SEMESTER</td>
<td>FALL</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>PROBABILISTIC TECHNIQUES</td>
</tr>
</tbody>
</table>

**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.

<table>
<thead>
<tr>
<th>LECTURES, TUTORIALS, EXERCISE</th>
<th>WEEKLY TEACHING HOURS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 (L), 2 (T), 1 (E)</td>
<td></td>
<td>5</td>
</tr>
</tbody>
</table>

**TOTAL**

5

**COURSE TYPE**

- SPECIAL BACKGROUND, SKILLS DEVELOPMENT

**PREREQUISITE COURSES:**

Recommended prerequisite knowledge from the following courses:
- PROBABILITY AND BASIC STATISTICS (CEID_NY204)
- DISCRETE MATHEMATICS (CEID_NY109)
- GRAPH THEORY AND APPLICATIONS (CEID_NY202)

**LANGUAGE OF INSTRUCTION and EXAMINATIONS:**

- INSTRUCTION AND EXAMINATION: GREEK (IN ENGLISH IF THERE ARE ERASMUS STUDENTS)
- LECTURE SLIDES: ENGLISH

**IS THE COURSE OFFERED TO ERASMUS STUDENTS?**

YES (ENGLISH)

**COURSE WEBSITE (URL)**

https://www.ceid.upatras.gr/webpages/courses/probmethweb/

(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

1) The study of basic probabilistic techniques and their use in the design and analysis of efficient probabilistic algorithms.

2) The ability for average analysis of deterministic algorithms with random inputs.

3) The understanding of selected random graph models and random processes and their combinatorial properties and uses.

4) Understanding the relevance and applicability of random graph models to modern technological networks and phenomena.

**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
Production of new research ideas
Working in an international environment
Others...
Working in an interdisciplinary environment

Search for, analysis and synthesis of data and information, with the use of the necessary technology
Adapting to new situations
Working independently
Working in an interdisciplinary environment
Production of free, creative and inductive thinking
Production of new research ideas

(3) SYLLABUS

- Non constructive proofs of existence of combinatorial structures
- The method of positive probability
- Linearity of expectation
- The deletion method
- The second moment method
- The Lovász local lemma
- The Janson inequality
- Martingales
- Random walks and Markov Chains
- Chernoff bounds
- Introduction to Randomized algorithms

(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<thead>
<tr>
<th>DELIVERY</th>
<th>FACE TO FACE</th>
</tr>
</thead>
<tbody>
<tr>
<td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</td>
<td>[\text{Lecture slides, Course website, e-class, forum, e-mail, progress.upatras.gr}]</td>
</tr>
<tr>
<td>Use of ICT in teaching, laboratory education, communication with students</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TEACHING METHODS</th>
<th>Activity</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>2*13=26 hours</td>
<td></td>
</tr>
<tr>
<td>Tutorials</td>
<td>2*13=26 hours</td>
<td></td>
</tr>
<tr>
<td>Exercise</td>
<td>1*13=13 hours</td>
<td></td>
</tr>
<tr>
<td>Study in each week</td>
<td>4*13=52 hours</td>
<td></td>
</tr>
<tr>
<td>Course total</td>
<td>132 hours</td>
<td></td>
</tr>
</tbody>
</table>

STUDENT PERFORMANCE EVALUATION

Description of the evaluation procedure: The evaluations of the student is performed through an oral examination in greek language on the presented methods, as well as on the deep understanding of a paper from the related bibliography.
<table>
<thead>
<tr>
<th>problem solving, written work, essay/report, oral examination, public presentation, laboratory work, clinical examination of patient, art interpretation, other</th>
<th>The evaluation criteria are the thorough understanding of the methods, the proofs that are included in the lecture slides and the research paper that is assigned to them. The criteria are accessible to students through the course website: (<a href="https://www.ceid.upatras.gr/webpages/courses/probmethweb/">https://www.ceid.upatras.gr/webpages/courses/probmethweb/</a>)</th>
</tr>
</thead>
</table>

Specifically-defined evaluation criteria are given, and if and where they are accessible to students.

(4) ATTACHED BIBLIOGRAPHY

- **Suggested bibliography:**

- **Related academic journals:**
  - Related bibliography is provided