COURSE OUTLINE

(1) GENERAL

<table>
<thead>
<tr>
<th>SCHOOL</th>
<th>School of Engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACADEMIC UNIT</td>
<td>Department of Computer Engineering &amp; Informatics</td>
</tr>
<tr>
<td>LEVEL OF STUDIES</td>
<td>Undergraduate</td>
</tr>
<tr>
<td>COURSE CODE</td>
<td>CEID_NY109</td>
</tr>
<tr>
<td>SEMESTER</td>
<td>1st</td>
</tr>
<tr>
<td>COURSE TITLE</td>
<td>Discrete mathematics</td>
</tr>
</tbody>
</table>

INDEPENDENT TEACHING ACTIVITIES

| Lectures and tutorial exercises | 3(L) 2 (TE) | 5 |

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

COURSE TYPE

general background

PREREQUISITE COURSES:

Recommended prerequisite knowledge in mathematics

LANGUAGE OF INSTRUCTION and EXAMINATIONS:

Greek

IS THE COURSE OFFERED TO ERASMUS STUDENTS:

No

COURSE WEBSITE (URL)

https://eclass.upatras.gr/courses/CEID1062/

(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

Upon completion of the course, students will be able to:

1. Know the basic principles of the combinatorics and the meanings of the combination and permutation
2. Be aware of the difference between counters and exponential function generators
3. To be able from a problem with a recurrence solution find the recursion relation and resolve it
4. Understand symmetries and colorations in geometric shapes
5. Be able to apply the Inclusion and Exclusion method
6. Acquire the ability to measure distinct events
7. Be aware of their basic choices in measurement problems.

Upon completion of the course, students will have developed the following skills:

1. Can solve measurement problems with a number of techniques.
2. Be able to find and solve recurrence relation in problems that can be resolved recursively.
3. Be able to use generating functions for measurement problems in which combinatorial use is not easy.
4. Describe and use symmetries in geometric patterns for measurement and coloring.

5. Be able to describe and implement the Inclusion and Exclusion Method for measurement problems.

**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 |
| Adapting to new situations | Respect for difference and multiculturalism |
| Decision-making | Respect for the natural environment |
| Working independently | Shewing 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... |

- Search, analyze and synthesize data and information, using the necessary technologies
- Adjustment to new situations
- Decision making
- Promote free, creative and inductive thinking

(3) **SYLLABUS**

- Introduction to combinatorics
  - The rules of Sum and Product
  - Permutations and Combinations
  - Binomial Coefficients
  - Distributions of Distinct Objects
  - Distributions of Nondistinct Objects
  - Stirling's Formula

- Generator Functions
  - Introduction definitions attributes
  - Generating Functions for Combinations
  - Enumerators for Permutations

- Recurrence Relations
  - Introduction
  - Linear Recurrence Relations with Constant Coefficients
  - Nonlinear Recurrence Relations

- Polya Theory of Measurement
  - Introduction
  - Type of Burnside
  - Theorem Polya

- Inclusion - Exclusion Principle
(4) TEACHING and LEARNING METHODS - EVALUATION

<table>
<thead>
<tr>
<th>DELIVERY</th>
<th>Face-to-face, Distance learning, etc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY</td>
<td>The slides of the course and additional auxiliary material are available from the website to the enrolled students. Lectures are also available as Open Courses</td>
</tr>
<tr>
<td>TEACHING METHODS</td>
<td>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.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Activity</th>
<th>Semester workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>13x3=39</td>
</tr>
<tr>
<td>Tutorial exercises</td>
<td>13x2=39</td>
</tr>
<tr>
<td>Repeatable lecture</td>
<td>1x3=3</td>
</tr>
<tr>
<td>Self-study</td>
<td>13x2=26</td>
</tr>
<tr>
<td>Study Weekends</td>
<td>13x2=26</td>
</tr>
<tr>
<td>Exam preparation week + 2 weeks of vacation</td>
<td>4x4=16</td>
</tr>
<tr>
<td>Course total</td>
<td>136</td>
</tr>
</tbody>
</table>

STUDENT PERFORMANCE EVALUATION

Description of the evaluation procedure

Language of evaluation: Greek

Final examination (100% of total score).

Written, graduated difficulty, covering all matter

After the examination, subjects are uploaded along with indicative solutions

(5) ATTACHED BIBLIOGRAPHY

- Suggested bibliography:
- Related academic journals:


Slides that have been posted on the course's website