

30214 - Computer Science Theory

Syllabus Information

Academic year: 2023/24

Subject: 30214 - Computer Science Theory

Faculty / School: 110 - Escuela de Ingeniería y Arquitectura
326 - Escuela Universitaria Politécnica de Teruel

Degree: 439 - Bachelor's Degree in Informatics Engineering
443 - Bachelor's Degree in Informatics Engineering

ECTS: 6.0

Year: 2

Semester: First semester

Subject type: Basic Education

Module:

1. General information

The objectives of the subject are basically of four types:

1. To enable the student to abstract problems to be solved by means of a computer.
2. To know the basic computational models on which current computers are based and to identify the most suitable one for each problem.
3. Assimilate well-studied problem paradigms in the context of computer science so that they can reduce or adapt them to the problems that arise.
4. Know the capabilities and limitations of automatic problem solving and evaluate the resources required for it.

Sustainable Development Goals, SDGs, of the 2030 Agenda (<https://www.un.org/sustainabledevelopment/es/>): Goal 1, target 1.4. Goal 8, target 8.2. Goal 16, target 16.5.

2. Learning results

The student, in order to pass this subject, must demonstrate the following results...

1. Know the basic calculation models.
2. Find the simplest computational model for each problem.
3. Discard incorrect solutions as being too simple for given problems.
4. Adequately describe the calculation processes.
5. Apply the formalisms of language theory in problem solving.
6. Transform informal statements into formal statements and vice versa.
7. Know the limitations of automatic troubleshooting.
8. Identify basic unsolvable problems such as the shutdown problem or the virus detection problem.
9. Analyze the cost in time and memory of an algorithm.
10. Identify problems that require too many computational resources.

3. Syllabus

The program is organized around three basic pillars: (1) Theory of formal languages, with emphasis on regular and context-independent languages; (2) Fundamentals of Computability, to narrow down what problems can be solved algorithmically; (3) Fundamentals of Algorithmic Complexity, to define what is the efficiency of an algorithm and what resources it needs.

- Topic 0: Preliminaries
- Topic 1: Regular Languages
- Topic 2: Context Independent Languages
- Topic 3: Computability

- Topic 4: Complexity

The concepts, methods and tools of the topics will be illustrated with realistic examples within the fields of: computer security, cryptography, natural language processing and information compression.

4. Academic activities

ACTIVITIES

- Classroom classes: development of the course syllabus.
- Problem classes: application of concepts and methods of the program to practical cases.
- Practical classes: work in a computer laboratory.

The calendar of the subject will be defined in the academic calendar of the Center.

STUDENT WORK

- EINA:
 - 56 hours of classroom activities
 - 40 hours of teamwork
 - 51 hours of effective self-study
 - 3 hours of final written exam
- EUPT:
 - 60 hours of classroom activities
 - 30 hours of teamwork
 - 55 hours of effective self-study
 - 5 hours of evaluation activities

5. Assessment system

EINA

- Laboratory work (30%). The previous script will be evaluated, identifying the information to solve the cases and its use, evaluating the selection of alternatives and the justification of the solution. In addition, the fluency in the use of software tools, the quality and efficiency of the solutions will be evaluated,.
- Written test (70%) in which questions and problems of a similar type and level of complexity to the used during the term will be posed. The quality and clarity of the resolution strategy, as well as its efficiency, will be assessed.
- A minimum grade of 4 out of 10 on the written test is required to pass the subject. Exceeding this minimum grade , the written test will be weighted 70% of the final grade. If this minimum is not reached, the final grade is the of the written test.

EUPT

The final grade of the subject in the ordinary exam is divided into:

- Written examination. 70% of the final grade. It will consist of a theory part and a problem part. In the middle of the term there will be a partial test that will allow to "advance" the grade for the exam.
- Theoretical work. 5% of the final grade. It will consist of a paper on a topic to be defined during the term that will deal with any of the topics of the subject.
- Practical sessions. 25% of the final grade. There will be several practical deliverables throughout the term.

A minimum grade of 4 out of 10 on the written test is required to pass the subject. If this minimum grade is obtained, then the weighting indicated above will be applied. If this minimum is not reached, then the grade in the subject is the written test.

As for the extraordinary exam, the final grade will be the grade of the extraordinary exam, taking into account that this exam will have a part of theory and problems that will be worth 75% of the total grade and a part of practices that will be worth 25%. The grades of the midterm and the paper will not be kept for the extraordinary exam.

Organization of the EINA and EUPT assessment

The student will pass the subject by carrying out the above activities, with the indicated weightings. The global assessment will consist of two parts corresponding to these activities and its date will be specified in advance by the center. Those who have passed the deliverable activities during the course may also apply for a higher grade in the global assessment.