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270207 - COM - Computers

Coordinating unit: 270 - FIB - Barcelona School of Informatics

Teaching unit: 701 - AC - Department of Computer Architecture

Academic year: 2019

Degree: BACHELOR'S DEGREE IN DATA SCIENCE AND ENGINEERING (Syllabus 2017). (Teaching unit Compulsory)

ECTS credits: 7,5 Teaching languages: Catalan

Prior skills

Basic programming

Degree competences to which the subject contributes

Basic:

CB1. That students have demonstrated to possess and understand knowledge in an area of ??study that starts from the base of general secondary education, and is usually found at a level that, although supported by advanced textbooks, also includes some aspects that imply Knowledge from the vanguard of their field of study.

CB2. That the students know how to apply their knowledge to their work or vocation in a professional way and possess the skills that are usually demonstrated through the elaboration and defense of arguments and problem solving within their area of ??study.

CB5. That the students have developed those learning skills necessary to undertake later studies with a high degree of autonomy

Specific:

CE4. Use current computer systems, including high performance systems, for the process of large volumes of data from the knowledge of its structure, operation and particularities.

Generical:

CG1. To design computer systems that integrate data of provenances and very diverse forms, create with them mathematical models, reason on these models and act accordingly, learning from experience.

CG2. Choose and apply the most appropriate methods and techniques to a problem defined by data that represents a challenge for its volume, speed, variety or heterogeneity, including computer, mathematical, statistical and signal processing methods.

CG4. Identify opportunities for innovative data-driven applications in evolving technological environments.

Transversal:

CT5. Solvent use of information resources. Manage the acquisition, structuring, analysis and visualization of data and information in the field of specialty and critically evaluate the results of such management.

CT6. Autonomous Learning. Detect deficiencies in one's own knowledge and overcome them through critical reflection and the choice of the best action to extend this knowledge.

CT7. Third language. Know a third language, preferably English, with an adequate oral and written level and in line with the needs of graduates.

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Teaching methodology

The course is based on classroom theory and laboratory. The lectures follow the program set out in this syllabus, are usually based on material provided through slides.

On the lectures, the course promotes a dialogue between teacher and students by providing activities carried out jointly based on particular aspects of the current topic.

Laboratory classes follow the same subjects and are based on documentation provided, explaining how to develop the current practice.

Learning objectives of the subject

1.Know about the objectives of the course
2.Work with different types of data, natural, integer, floating point, and their grouping
3.Demonstrate knowledge and understanding of the fundamentals of computers and on the basic structure of a computer.
4.Describe and work with the program execution environment.
5.Knowledge on the structure of programs, and be able to work with their analysis and management tools.
6.Know about the basic principles of the programming languages.
7.Knowledge and work with the operating system services
8.Knowledge and work with libraries
9.Know and work with the program compilation tools
10.Know and work with parallel programming models
11.Know and work with basic techniques of performance analysis
12.Know and work with the input/output tools provided by the execution environments
13.Know and work with the storage systems

Study load

Total learning time: 187h 30m	Theory classes:	45h	24.00%
	Laboratory classes:	30h	16.00%
	Guided activities:	0h	0.00%
	Self study:	112h 30m	60.00%

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Content

Data representation

Degree competences to which the content contributes:

Description:
Know and work with the different data types and their representation in computers. Binary encoding, characters, integers, strings, floating point values, and their grouping in classes, structures, and unions.

Computer elements

Degree competences to which the content contributes:

Description:
Description of the elements that constitute a computer: processors, memory hierarchy, input/output components, data storage and the way they are interconnected.

System libraries

Degree competences to which the content contributes:

Description:
This chapter presents the functionalities offered by the system libraries.
Shows the format of executable files, and how and which information can be obtained from them.

Compilation environment

Degree competences to which the content contributes:

Description:
It presents the tools performing compilation and interpretation of programming languages. It describes the compilation and optimization options offered by compilers. It completes the structure of the executable files, with symbol table, and debugging information.

Operating System

Degree competences to which the content contributes:

Description:
Describes the objectives of the Operating System in an execution environment. This chapter presents the basic OS abstractions and its interface. System calls, interrupts, exceptions.

Programming foundations

Degree competences to which the content contributes:

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Description:
Description of the basic environment on top of which programs can be executed. Definition of operating system, execution levels, user and system (privileged), concepts of program and process. Program and libraries structure. Basic principles of programming languages, interpretation and compilation. Assembly language. Translation from high level languages to low level languages.

Introduction to parallelism

Degree competences to which the content contributes:

Description:
Parallelism and concurrency. Processes and threads. Synchronization. Programming models

Basic techniques of performance analysis

Degree competences to which the content contributes:

Description:
Performance of applications, metrics, sources of the information, performance counters, high resolution timers. Performance analysis, Gflops, bandwidth.

Input/output subsystem

Degree competences to which the content contributes:

Description:
It introduces the input/output subsystem of the execution environment, channels, terminals, files, pipes.

Storage systems

Degree competences to which the content contributes:

Description:
It describes the physical components of the Input/Output system to store data: disks, and filesystems. It provides a view of the fault tolerance mechanisms, based on redundant disks systems and logical volumes.

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Planning of activities

Course presentation	Hours: 6h 30m Theory classes: 0h 30m Practical classes: 0h Laboratory classes: 4h Guided activities: 0h Self study: 2h
Specific objectives: 1	

Data representation	Hours: 10h 30m Theory classes: 2h 30m Practical classes: 0h Laboratory classes: 2h Guided activities: 0h Self study: 6h
Specific objectives: 2	

The computer and its elements	Hours: 18h Theory classes: 6h Practical classes: 0h Laboratory classes: 2h Guided activities: 0h Self study: 10h
Specific objectives: 3	

Libraries and compilation	Hours: 15h Theory classes: 3h Practical classes: 0h Laboratory classes: 4h Guided activities: 0h Self study: 8h
Specific objectives: 8, 9	

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Operating System	Hours: 15h 30m Theory classes: 5h Practical classes: 0h Laboratory classes: 2h Guided activities: 0h Self study: 8h 30m
Specific objectives: 7	

Partial control	Hours: 13h Guided activities: 3h Self study: 10h
Specific objectives: 1, 2, 3, 4, 5, 6, 7, 8, 9	

Fundamentals of programming	Hours: 22h Theory classes: 6h Practical classes: 0h Laboratory classes: 4h Guided activities: 0h Self study: 12h
Specific objectives: 4, 5, 6	

Parallelism	Hours: 18h Theory classes: 6h Practical classes: 0h Laboratory classes: 2h Guided activities: 0h Self study: 10h
Specific objectives: 10	

Performance analysis	Hours: 14h Theory classes: 4h Practical classes: 0h Laboratory classes: 2h Guided activities: 0h Self study: 8h

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Specific objectives:
11

Input/output and communications	Hours: 15h Theory classes: 4h Practical classes: 0h Laboratory classes: 1h Guided activities: 0h Self study: 10h

Specific objectives:
12

File systems	Hours: 15h Theory classes: 4h Practical classes: 0h Laboratory classes: 1h Guided activities: 0h Self study: 10h

Specific objectives:
13

Laboratory test	Hours: 12h Guided activities: 2h Self study: 10h

Description:
Laboratory test of the course, consisting of a laboratory session, with a specific wording, done in an individual way. It is performed during a particular lab session.

Specific objectives:
1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13

Final exam	Hours: 13h Guided activities: 3h Self study: 10h

Description:
Final exam of the course, consisting of theoretical questions related to all subjects explained in both theoretical classes and laboratory sessions

Specific objectives:
1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13

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Qualification system

There are two exams for the theory part:
- PT: The partial theory control (15%)
- FT: The final theory exam (60%)

Regular Assessment: The final mark of the course comes from
- MAX(75%FT; 15%PT+60%FT)
- The lab test (15%)
- We also assess a homework deliverable (to be defined during the course) (5%) and the lab deliveries (5%) that are related to the competences Solvent Usage of Information Resources and Autonomous Learning, respectively.

Reassessment: Only the students that fail the course (that is, students that have performed the partial and/or final theory exam) can go to the Reassessment exam (only theory exam). Thus, the Reassessment mark substitutes the global theory mark (that is, 75% of the course mark). Anyhow, if the regular assessment mark was 4 or higher and the new mark (including the Reassessment mark) is lower, then we keep the regular mark.

Bibliography

Basic:

Patterson, D.A.; Hennessy, J-.L.; Alexander, P. Computer organization and design: the hardware/software interface. 5th ed. Burlington: Elsevier Morgan Kaufmann, 2014. ISBN 9780124077263.

Others resources:

Hyperlink

http://docencia.ac.upc.edu/FIB/GCED/COM