804039 - ACI-M - Computer Architecture and Configuration

Coordinating unit: 804 - CITM - Image Processing and Multimedia Technology Centre
Teaching unit: 804 - CITM - Image Processing and Multimedia Technology Centre
Academic year: 2019
Degree: BACHELOR'S DEGREE IN MULTIMEDIA STUDIES (Syllabus 2009). (Teaching unit Compulsory)
ECTS credits: 6 Teaching languages: Catalan, Spanish

Teaching staff

Coordinator: Careglio, Davide

Degree competences to which the subject contributes

Specific:

4. (ENG) Diferenciar els tipus de components d'un computador i els principals paràmetres del seu funcionament.

5. (ENG) Diagnosticar de forma bàsica les prestacions d'un computador i d'una xarxa.

6. (ENG) Analizar las necesidades de seguridad de las comunicaciones.

Transversal:

1. SELF-DIRECTED LEARNING. Detecting gaps in one's knowledge and overcoming them through critical self-appraisal. Choosing the best path for broadening one's knowledge.
2. EFFICIENT ORAL AND WRITTEN COMMUNICATION. Communicating verbally and in writing about learning outcomes, thought-building and decision-making. Taking part in debates about issues related to the own field of specialization.
3. EFFECTIVE USE OF INFORMATI0N RESOURCES. Managing the acquisition, structure, analysis and display of information from the own field of specialization. Taking a critical stance with regard to the results obtained.

Teaching methodology

Sessions divided into several areas of activities:
- Acquisition of new knowledge.
- Questions, doubts, exposition and defense of concepts and / or exercises.
- Periodic checks and partial examinations.
- Perform theoretical or practical exercises.
- Presentations by the students
- Lab session with Linux

Learning objectives of the subject

(ENG)
1. Entendre l'arquitectura d'un ordinador: parts i funcionament.
2. Comprendre el funcionament i operació dels Elements Bàsics d'un sistema informàtic incloent el processador, la memòria i l'entrada / sortida.
3. Diferenciar els tipus de components d'un ordinador i els principals paràmetres de funcionament.
4. Diagnosticar de forma bàsica les prestacions d'un ordinador.
5. Relacionar l'arquitectura d'un ordinador amb el sistema operatiu.
6. Configurar i operar en un entorn de treball Linux.
7. Aplicar els coneixements assolits a la realització d'una tasca en funció de la importància, decidint la forma de dur-ho a terme i el temps que fa falta dedicar i seleccionant les fonts d'informació més adequades.

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8. Planificar i utilitzar la informació necessària per a un treball acadèmic a partir d'una reflexió crítica sobre els recursos d'informació utilitzats.
9. Comunicar-se de forma clara i eficient en presentacions orals i escrites.

Study load

Total learning time: 150h	Hours large group:	0h	0.00%
	Hours medium group:	60h	40.00%
	Hours small group:	0h	0.00%
	Guided activities:	0h	0.00%
	Self study:	90h	60.00%

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Content

Unit 1 - Introduction

Learning time: 16h

Theory classes: 6h
Self study : 10h

Description:
- Evolution of computers to justify and detail the course agenda. Explanation of the methodology followed in the subject.
- Von Neumann architecture.
- Motherboard: format, components, BIOS.

Unit 2 - The microprocessor

Learning time: 36h

Theory classes: 16h
Self study : 20h

Description:
- Basic characteristics of the microprocessor
- Architectures RISC, CISC, VLIW (or EPIC)
- Parallelism
    * At the level of instruction: segmentation, superscalarity
    * At the processor level: multi-core. Processes Threats
- Processor performance, cost.
- Amdahl's law
- Improvements in performance with segmentation and scalability
- Comparative performance analysis

Unit 3 - Memory

Learning time: 25h

Theory classes: 10h
Self study : 15h

Description:
- Evolution of memories.
- Hierarchy of memories.
- Internal architecture.
- Memory operation parameters.
- Types of memories.
- Classification of RAM memories.
- Evaluation of the performance of the memory system.
- Memory management from the Operating System. Virtual memory.
- Calculation of memory system performance.
    * Average access time.
    * Impact on overall performance: CPU time.
- Cache design parameters.
- Virtual memory.
- Use of simulation tools for the architecture of a computer.

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Unit 4 - Buses	Learning time: 6h Theory classes: 2h Self study : 4h

Description:
- Types and behaviour

Unit 5 - External memory	Learning time: 12h Theory classes: 4h Self study : 8h

Description:
- Solid state drives. SSD
- Magnetic Disks.
    * IDE / ATA, SATA, SCSI, SAS technologies
    * Performance measurement parameters
    * RAID architectures

Unit 6 - Input/Output (I/O) devices	Learning time: 12h Theory classes: 4h Self study : 8h

Description:
- Architecture of I/O devices
- I/O operations programming
- Synchronization of operations
- Transfer of information

Weeks 8 and 14: Evaluation	Learning time: 14h Theory classes: 4h Self study : 10h

Description:
First and second midterm exam

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Weeks 9 and 15: Presentations	Learning time: 17h Theory classes: 4h Self study : 13h

Description:

Towards the end of the first third of the course, teachers will present possible topics of interest related to this subject. At the end of this session, students will be asked to form groups of 3 people and choose one of the topics presented (there is also the possibility that students propose a topic). For the next 3 weeks, each group must prepare (outside class hours) a 15/20 minute presentation on the chosen topic. At the end of these 3 weeks, each group will present their presentation in class and answer the questions of the other students and teachers.

By the end of the second third of the course, each group will have another 3 weeks to prepare a new topic. While the first presentation will be about past and present technologies, the topics of this second presentation will be about the technology of the future.

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Planning of activities

Lab - Linux work environment

Hours: 12h
Theory classes: 4h
Self study: 8h

Description:
- Linux virtual machine installation.
- Introduction to the Linux work environment.
- Linux OS performance monitoring.
- Process management in Linux.

Support materials:
Linux Ubuntu desktop distribution

Descriptions of the assignments due and their relation to the assessment:
A guided report at the end of each session

Two oral presentations

Hours: 16h
Theory classes: 4h
Self study: 12h

Description:
Towards the end of the first third of the course, teachers will present possible topics of interest related to this subject. At the end of this session, students will be asked to form groups of 3 people and choose one of the topics presented (there is also the possibility that students propose a topic). For the next 3 weeks, each group must prepare (outside class hours) a 15/20 minute presentation on the chosen topic. At the end of these 3 weeks, each group will present their presentation in class and answer the questions of the other students and teachers.
By the end of the second third of the course, each group will have another 3 weeks to prepare a new topic. While the first presentation will be about past and present technologies, the topics of this second presentation will be about the technology of the future.

Two midterm exams

Hours: 18h
Theory classes: 4h
Self study: 14h

Description:
A midterm exam will be conducted on the first two topics.
A second midterm exam will be held at the end of the course on the other topics.
Each midterm exam will contain test questions and problems.

Final exam

Hours: 10h
Theory classes: 2h
Self study: 8h

Description:
Final exam of the subject on all units.
The exam will contain test questions and problems.

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Qualification system

The grade is the result of a weighted sum of three components, the continuous evaluation (EC), the practical works (TP) and the participation and attitude (PA).

Final Note = 55% EC + 35% TP + 10% PA

The grade of the continuous evaluation (EC) is calculated as follows:
- 25%: Midterm test and problems of the first part of the course.
- 25%: Second midterm of theory and problems of the second part of the course.
- 50%: Final exam with contents of the entire course.

The mark of the practical works (TP) is calculated as follows:
- 37.5%: Note of the first presentation.
- 37.5%: Note of the second presentation.
- 25%: Note of the practice of operating systems with Linux.

In the case of suspending the subject, there is the possibility of reassessing the evaluation continued with the recovery exam. Keep in mind that the mark of this exam only affects 55% of the final grade, the practical work and participation and attitude notes cannot be recovered. The maximum final grade that can be achieved with this recovery exam is 5.

Regulations for carrying out activities

The two midterm exams will include a written part of theory and problems.
In the final exam, there will be a written part of theory and problems. The contribution of each part in points to the total exam grade will be indicated.
Regarding the two presentations, the evaluation considers both the material and the manner in which it was presented taking into account three criteria: understanding of the subject, order in the presentation, ability to synthesize.
The practice part with operating system is evaluated with the delivery of a report at the end of each session and a final delivery at the end of the course.

Les revisions i / o reclamacions respecte als exàmens es realitzaran exclusivament durant les dates i horaris establerts en el Calendari Acadèmic.

Bibliography

Complementary:

Stallings, William. Organización y arquitectura de computadores. 7ª ed. Madrid: Prentice Hall, 2006. ISBN 9788489660823.

Herrerías Rey, Juan Enrique. Manual fundamental de el PC : hardware y componentes : edición 2010. Madrid: Anaya Multimedia, 2010. ISBN 9788441527171.

Miguel Anasagasti, Pedro de. Fundamentos de los computadores. 9ª ed. Madrid: Thomson Paraninfo, 2004. ISBN 8497322940.