Course guides
330234 - SO - Operating Systems

Unit in charge: Manresa School of Engineering
Teaching unit: 750 - EMIT - Department of Mining, Industrial and ICT Engineering.
Degree: BACHELOR’S DEGREE IN ICT SYSTEMS ENGINEERING (Syllabus 2010). (Compulsory subject).
Academic year: 2020  ECTS Credits: 6.0  Languages: Catalan, Spanish, English

LECTURER

Coordinating lecturer: Demirkol, Ilker Seyfettin

Others:

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
1. (ENG) La capacit d’anàlitzar, dissenyar i mantenir aplicacions informàtiques així com el coneixement dels principis i eines de l’enginyeria del software i la seva aplicació.
2. (ENG) El coneixement i la capacitat d’usar les eines i l’instrumentació existents per a l’anàlisi, el disseny, el desenvolupament i la verificació de sistemes electrònics, informàtics i de comunicacions.
3. (ENG) La capacitat per a desenvolupar les activitats pròpies del grau considerant els estàndarts, reglaments i normes reguladores corresponents.
4. (ENG) El coneixement de l’estructura i de les funcions dels sistemes operatius i la capacitat d’usar els seus serveis per a resoldre problemes.
5. (ENG) Capacitat per a desenvolupar les activitats pròpies del grau tenint en compte els estàndards, reglaments i normes reguladores corresponents.

Transversal:
6. TEAMWORK - Level 3. Managing and making work groups effective. Resolving possible conflicts, valuing working with others, assessing the effectiveness of a team and presenting the final results.
7. EFFECTIVE USE OF INFORMATION RESOURCES - Level 3. Planning and using the information necessary for an academic assignment (a final thesis, for example) based on a critical appraisal of the information resources used.
8. SELF-DIRECTED LEARNING - Level 3. Applying the knowledge gained in completing a task according to its relevance and importance. Deciding how to carry out a task, the amount of time to be devoted to it and the most suitable information sources.

TEACHING METHODOLOGY

The course consists of face-to-face activities consisting of 2 hours a week in the classroom (large group) and 2 hours a week in the laboratory (small group). The student learns through various mechanisms. In the participatory lecture classes in the classroom, the contents of the subject are presented, where teaching methods of cooperative learning and active learning are used. These methods will allow interaction among students, and between students and the teacher.

In the laboratory classes the students carry out a previous work that helps to put in context the work that is intended to be carried out in the laboratory. The laboratory activity itself is carried out in groups of two students and allows them to experiment with certain aspects developed in the subject.

Through the projects, students will practice project-based learning. The projects will provide students with the opportunity to develop a solution to realistic engineering problems. The writing of the memory and the presentation of the projects allow working the oral and written communication skills.
LEARNING OBJECTIVES OF THE SUBJECT

After finishing this course, the student will:
1. Know the fundamentals and architecture of an operating system and how to apply it to resolve typical engineering problems.
2. Know how to obtain and interpret technical information and be able to communicate results orally and in writing.
3. Be able to write simple technical reports, also in a third language, and present them orally.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours small group</td>
<td>30,0</td>
<td>20.00</td>
</tr>
<tr>
<td>Self study</td>
<td>90,0</td>
<td>60.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>30,0</td>
<td>20.00</td>
</tr>
</tbody>
</table>

Total learning time: 150 h

CONTENTS

TOPIC 1: Introduction to Operating Systems

Description:
The concept of operating system is introduced and a general perspective is given that allows understanding its function, the agents that interact, and the various typologies that exist. It is used to explain the structure of the course.
Key words: Operating system, user, shell.

Specific objectives:
Once the topic is covered, the student is expected to:

1. Understand what an operating system is, what functionality it offers and what typologies of systems exist.

Related activities:
All the relevant ones.

Full-or-part-time: 10h
Theory classes: 2h
Laboratory classes: 2h
Self study: 6h
TOPIC 2: Use of the shell

Description:
The general objective of the topic is to introduce the concept of shell and learn the general features of its use, both interactively and in shell-script mode. The main elements that are interesting to highlight are those that, later, will have a more relevant role in the rest of the course.
Keywords: Shell, process, file, pipe, device.

Specific objectives:
Once the topic is assumed, the student will:
1. Know how to write small programs for the shell.
2. Understand the concepts of process, file and device.
3. Know how to combine processes using pipes.
4. You must know the most frequent system orders.

Related activities:
All the relevant ones.

Full-or-part-time: 20h
Theory classes: 4h
Laboratory classes: 4h
Self study: 12h

TOPIC 3: Operating System Services

Description:
The main line of the topic is to introduce the student to the main services offered by the operating system, focusing specifically on files, processes and devices, as well as some of the communication tools between processes.
Keywords: File, process, fork, exec, device, pipe, semaphore, lock, signal.

Specific objectives:
Once the topic is done, the student will:
1. Be able to design and implement C-written applications that take advantage of the operating system services.
2. Know the main services of the operating system and its semantics.

Related activities:
All the relevant ones.

Full-or-part-time: 60h
Theory classes: 12h
Laboratory classes: 12h
Self study: 36h
TOPIC 4: Operating system implementation

Description:
The topic covers the most common techniques for implementing the services of an operating system, especially the implementation of processes, concurrency control mechanisms, memory management and devices. Keywords: File, process, fork, exec, device, pipe, semafor, lock, signal.

Specific objectives:
Once the topic is covered, the student is expected to:
1. Understand the main techniques of implementing an operating system.
2. Be able to apply the learned techniques to small implementations.

Related activities:
All the relevant ones.

Full-or-part-time: 60h
Theory classes: 12h
Laboratory classes: 12h
Self study : 36h

ACTIVITIES

LECTURES

Description:
They are face-to-face classes specifically dedicated to the understanding of the contents of the course, especially those of a rather theoretical nature.

Material:
The support materials are:
- Main references of the subject.
- Collection of problems of the subject.

Delivery:
Occasionally, quizzes will be conducted. The grades obtained in these activities corresponds the variable QUIZ.

Full-or-part-time: 30h
Theory classes: 30h

LABORATORIES

Description:
The student's objective is the solution of small practices that complement the contents and collaborate in a better understanding of them. The practices are carried out in the laboratory and involve the real implementation of programs on the computer and their verification. The activity may lead to the end of the practices in autonomous learning time.

Delivery:
During the lab sessions, the achievement of the objectives will be assessed taking into account the degree of understanding of the work demonstrated for each student. At the end of each practice, each group will give the teacher a file explaining the work done and the knowledge gained. The grade obtained in these activities defines the overall grade variable LAB.

Full-or-part-time: 30h
Laboratory classes: 30h
PROJECTS

Description:
The programming projects are assignments that would allow the students use the concepts learned in classes and practiced in labs. This activity is done individually.

Delivery:
1. The project report.
2. The source code resulting from the project.
3. An explanation of the code.
The report, the code and the explanation are evaluated. The evaluation determines the PRJ parameter of the final grade.

Full-or-part-time: 36h
Self study: 36h

STUDY OF THE CONTENTS

Description:
The study of the contents is the individual or collaborative activity that leads to the understanding of the knowledge, vocabulary and techniques that are part of the contents of the course.

Material:
The support materials are:
- Main references of the subject.
- Collection of problems of the subject.

Full-or-part-time: 44h
Self study: 44h

EXAM

Description:
The course includes a final exam consisting of a set of questions to be solved individually on paper without the support of any type of material and in a limited time.

Delivery:
The individual exam solutions are delivered and evaluated. The exam grade corresponds to the course grade variable FIN.

Full-or-part-time: 10h
Self study: 10h

GRADING SYSTEM

The final grade is calculated with the following weights:

Overall grade = 0.30 * QUIZ + 0.25 * PRJ + 0.25 * FIN + 0.20 * LAB
EXAMINATION RULES.

The activities will be carried out following the uses and customs of academic work and, in particular, the following guidelines will be respected:

* Those activities that are explicitly declared as individual, whether they are face-to-face or not, will be carried out without any collaboration by other people.
* The dates, formats and other delivery conditions established will be mandatory.
* If any of the activities of the subject is not carried out, it will be considered graded with zero.
* The completion of laboratory activities is a necessary condition to pass the course.
* The use of the computer laboratory will be reserved exclusively for academic activities and in no case may abusive use be made.

BIBLIOGRAPHY

Basic:

Complementary: