UNIVERSITAT D'ANDORRA

Seminar syllabus

Degree	Bachelor in Computer Science

Module	M7: Networks and Computer Security
Seminar	Operating Systems
Semester	4
Professor **email**	Alan Ward <award@uda.ad>
Mode	Face-to-face and virtual
Teaching language	English

1. Seminar presentation

This seminar introduces the different abstractions provided by operating systems (processes, memory space, files, and peripherals), delves into selection algorithms, and response time and capacity calculations.

The seminar illustrates the theoretical concepts through an introduction to the different tools of the Linux operating system to solve how the abstractions have been implemented as well as the different system tools.

Finally, the critical part is worked out and how to understand how the operating system works makes it vulnerable but in the same way they are more knowledgeable about how to protect it.

2. Seminar contents

Unit 1. Introducing the Operating System

1. What is an Operating System?
2. Historical overview and examples
3. Virtual Machine (VM)
4. Services of an OS
5. Basic concepts associated with an OS
   - 5.1. The kernel
   - 5.2. Modules
   - 5.3. System software
   - 5.4. Userland applications
   - 5.5. Privileged and unprivileged running modes

Unit 2. Process management

1. CPU management
   - 1.1. Processes
   - 1.2. Process identification and privileges
2. Batch processes
3. Interactive processes
4. UNIX System Calls
5. The bootloader: initial boot and handing off to the init process
6. The process tree: mother and child processes, process groups

Unit 3. Memory management

1. Basic concepts
2. Virtual Memory
3. Segmentation
4. Pagination, the MMU and the TLB
5. Pointers and callback functions

Unit 4. Input / Output

1. Introduction
2. Drivers: static and dynamic models
3. Software layers in I/O
4. Planning I/O
5. Planning disk operations
6. Drive technologies
    6.1. Rotational drives
    6.2. Solid State Drives (SSD)
    6.3. NVME drives

Unit 5. File Systems

1. Introduction : what is a File System?
2. UNIX inodes and superblocks
3. File access methods
4. File access rights
5. File system types (Windows, Apple, Linux)
6. The FS tree and Mounting
    6.1. Folders and directories

Unit 6. User management

1. Users and the OS
2. Privileged users
3. User groups
4. Access Control Lists
5. Auditing user security

Unit 7. An introduction to concurrent programming

1. Concurrent programming: models and justification
2. Some problems: deadlock, indeterminism and equitability
3. Mutual exclusion
4. Process communication and synchronization
5. Classical problems with process synchronization
6. Local and network concurrent programming

3. Seminar activities

3.1. Continuous assessment

Continuous assessment involves carrying out different assessment activities during the semester that will be set out in the seminar calendar: 3 in-person tests (CP) and the module challenge (el *repte*) with the following weights for each learning outcome:

	CP 1	CP 2	CP 2	CHALLENGE Mandatory	Total Evaluation
BInfo-E008-04	30%	30%	40%	0%	**100%**
BInfo-E008-05	30%	30%	40%	0%	**100%**
BInfo-E008-06	20%	20%	20%	40%	**100%**
BInfo-T006-02	0%	0%	0%	100%	**100%**
BInfo-T009-02	0%	0%	0%	100%	**100%**

3.2. Final assessment

The final assessment includes carrying out different assessment activities during the semester: 1 final exam (FE), and the module challenge with the following weights for each learning outcome:

	EF	CHALLENGE Mandatory	Total Evaluation
BInfo-E008-04	100%	0%	**100%**
BInfo-E008-05	100%	0%	**100%**
BInfo-E008-06	60%	40%	**100%**
BInfo-T006-02	0%	100%	**100%**
BInfo-T009-02	0%	100%	**100%**

4. Seminar resources

Basic bibliography, additional bibliography and mandatory readings are set out in the document available on the campus.

A presentation and a practice worksheet are also available for each separate unit.

5. Seminar remarks

- All assessable submissions must be made on the virtual campus of the UdA and must be submitted in the format specified in the activity instructions. Unless otherwise indicated, they must by default be handed in using the PDF file format.
- In person assessments will only be repeated in exceptional cases. To request the repetition of an assessment, the reason for the absence must be justified by presenting supporting documentation.
- Late submissions will not be accepted.
- If a student does not submit any of the activities to be assessed, the grade for the learning outcomes associated with the uncompleted activity will be equal to zero.
- All submissions to be assessed will be made on the UdA virtual campus and in the format indicated in the activity's instructions.
- Any use of an Artificial Intelligence system during assessment activities is strictly prohibited, and will be considered to be academic malfeasance.
