

<b>Pre-Requisite Modules code(s)</b>	<b>Co-Requisite Modules code(s)</b>	<b>ECTS Credits</b>	<b>Module Code</b>	<b>Module Title</b>
		5	CMPU2018	Operating Systems and System Administration

#### 8.2.4. Operating Systems and System Administration

**Module author:** Ken O'Brien

##### **Module Description:**

This module serves to extend the learner's knowledge of operating systems design and operation. It introduces students to the principles and practice of Systems Administration. The concepts are re-enforced with practical laboratory exercises in operating system management. Practical shell programming assignments are also given to develop practical operating systems skills.

##### **Module aim**

The aim of this module is to extend the students' knowledge of the principles of operating system design and to develop in them a working knowledge of operating systems and systems administration.

##### **Learning Outcomes:**

On completion of this module, the learner will be able to:

- describe the functions of the major components of an operating system
- describe the interactions between these components
- describe different types of operating system
- control the behaviour of an operating system through a command interface
- describe the fundamental tasks of a UNIX or a Windows systems administrator.
- perform basic system administration tasks on operating systems
- describe the user and group management mechanisms and tools on Windows and UNIX systems
- describe the system start-up and shutdown processes on a UNIX system.
- describe and modify the start-and shutdown order of services on a UNIX system.
- install configure and remove software systems on a UNIX platform
- automate simple system management functions by writing shell scripts.
- appreciate and evaluate of the impact of accessibility requirements on O/S functionality

##### **Learning and Teaching Methods:**

Lectures will be used to present the material and pace the learning process throughout the module. Laboratory exercises will be used to re-enforce the learning experience.

Practical assignments will be given throughout the module to allow students to gain experience of operating system programming and system administration.

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### Module content:

Definition of an operating system, functions of an operating system, event-driven systems, protection mechanisms, virtual resources, evolution of operating system designs, examples of operating systems.

Using an Operating System: the programmer's view, event-driven programming, exceptions, the shell, graphical shells.

Filesystems: files and directories, pathnames and filenames, multiple filesystems, file types, filenames, file versions, links and shortcuts, file locking, file attributes, disk structure, backup systems, example filesystems.

processes and threads: threads, Interprocess communication, synchronisation, mutual exclusion, deadlock, livelock, starvation, priority inversion.

Memory Management: address spaces, virtual memory, demand paging, swapping, page tables, shared memory, page faults, copy-on-write, segmentation.

Hardware Support: computer operation, user and kernel modes, kernel memory, system calls, memory management hardware, caching, power management, hardware failure.

The kernel: kernel responsibilities, implementing threads, kernel objects, process management, scheduling, exception handling, memory management, kernel processes, daemons.

Device Drivers: The I/O subsystem, device drivers, types of device, buffering, device driver structure, Linux device drivers, Windows device drivers.

Multiprocessor Systems: Multiprocessor systems, multicomputer systems, clients and servers,

Role of a System Administrator, boot process, controlling processes, filesystem management, user management, system security, data security.

Laboratory Work: In addition to the lecture material studied in class, a weekly lab session focusing on the UNIX operating system will be scheduled. This strand will be a hands-on approach to understanding and using the basics of the UNIX operating system, including shell script programming. Operating Systems and Accessibility: Legal and Economic Mandate, Vendor Initiatives, API bottleneck, Clipboard issues.

### Module Assessment:

Written examination 70%. Continuous assessment 30%.

### Essential Reading:

English J. (2003), Introduction to Operating Systems, Palgrave Macmillan ISBN 0-333-99012-9

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**Supplemental Reading:**

Flynn I.M. & A. McIver McHoes A. (2010), Understanding Operating Systems, 6th ed., Course Technology

Dalheimer M., Welsh M. (2006) Running Linux 5<sup>th</sup> ed. O'Reilly

Wirzenius L. Oja J. (2004) The Linux System Administrator's Guide, Linux Documentation Project

Stallings W. (2009), Operating Systems: Internals and Design Principles, 6<sup>th</sup> Ed. Prentice Hall

**Further Details:**

2 lectures and 1 laboratory per week, delivered over one semester

**Date of Academic Council approval .....**