Pre-Requisite Modules code(s)	*Co-Requisite Modules code(s)*	*ECTS Credits*	*Module Code*	*Module Title*
None	*None*	*5*	*CMPU1015*	*Introduction to Operating Systems*

8.1.9. Introduction to Operating Systems

Module author: Ken O'Brien

Module Description:

This module will serve as an introduction to Operating Systems. It provides an overview of the major components of a computer system and their interaction with the systems software. The module provides a fundamental understanding of the concepts of operating systems. Students will also learn how and why operating systems have evolved over years and the impact this has had on modern operating systems. The concepts will be reinforced with practical laboratory exercises in operating systems functionality, user interaction and management. This will be further backed up by a focus on command line interaction with various operating systems. Practical assignments will be given to develop practical operating systems skills. The module will, at a basic level introduce networked, client-server and distributed operating systems to the student. The module will provide the fundamentals for Advanced Operating Systems and the groundwork for other modules in computer science that assume a general understanding of operating systems principles and practice.

Module aims

The aim of this module is:

- to introduce the student to the principles of operating systems design
- to give the students a working knowledge of a modern operating system
- to provide the student with a sound knowledge of the various components and interactions of a modern operating system
- to develop a competency in practical interaction with an operating system

Learning Outcomes:

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

- Explain the benefits of an operating system in a computing environment
- List and describe the major components of an operating system and their basic functions
- Discuss the fundamental trade-offs involved in the design of operating systems
- Differentiate between the concept of processes and threads of control
- Classify scheduling policies with examples from different operating systems
- Appraise memory management techniques and virtual memory implementations
- Examine various file systems and illustrate their relationship with the IOCS
- Compare and contrast the strengths and weaknesses of different modern operating systems

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None	*None*	*5*	*CMPU1015*	*Introduction to Operating Systems*

- Discuss networked, client-server and distributed operating systems and how they differ from single user operating systems
- Demonstrate proficiency in command line interaction with various operating systems

Learning and Teaching Methods:

In this module a number of teaching methods will be employed including lectures, practical sessions, tutorials and case studies. At least one industrial seminar may be arranged. Students may be introduced to the use of Virtual Operating System resources. Online student discussion groups, reflective blogs for use immediately after practical sessions and voluntary Q&A sections may also be included.

Module content:

- **Introduction:** Definition of an operating system, abstract views of an operating system, functions of an operating system, event-driven systems, efficiency & system performance goals, evolution of operating system designs, classes of operating systems and examples of operating systems.
- **Process and Threads:** Process and programs, programmers' view of processes, operating systems view of processes, concurrency, process states, thread of control, interacting processes.
- **Scheduling:** Non pre-emptive scheduling policies, pre-emptive scheduling policies, scheduling in practice, real-time scheduling, example scheduling in UNIX, Linux and Windows.
- **Memory Management:** Memory hierarchy, address spaces, static and dynamic memory, memory allocation to a process, continuous memory allocation, non-continuous memory allocation, swapping and relocation, paging, segmentation, paging with segmentation. Virtual memory basics, demand paging, page replacement policies, memory allocation to a process, page faults.
- **File System & IOCS:** Files and file operations, directories and directory operations, pathnames and filenames, multiple file systems, file types, file sharing, links and shortcuts, file locking, file attributes, disk structure, examples of UNIX, Linux and Windows file systems. Architecture of the IOCS**,** device drivers, types of devices, buffering, device driver structure.
- **Multiprocessor Systems**: Multiprocessor systems, multicomputer systems, clients and servers, distributed file systems, distributed processing, introduction to thin client computing.
- **Laboratory Work:** In addition to the lecture material studied in class, a weekly laboratory session focusing on Linux and UNIX-like operating systems will be scheduled. This session will be a hands-on approach to understanding and using the basics of Linux and UNIX-like operating systems. Topics covered include basic Linux commands, working with file systems, process management, the vi editor, working with shells, a brief introduction to shell scripting.

Module Assessment

This module should have a 70% weighting for the examination and a 30% weighting for the continuous assessment.

Pre-Requisite Modules code(s)	*Co-Requisite Modules code(s)*	*ECTS Credits*	*Module Code*	*Module Title*
None	*None*	*5*	*CMPU1015*	*Introduction to Operating Systems*

Essential Reading:

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

John English, 2005, *Introduction to Operating Systems: Behind the Desktop*, Palgrave McMillian.

D.M. Dhamdhere, 2007, *Operating Systems: A Concept based Approach,* McGraw Hill.

Supplemental Reading:

William Stallings, 2009, Operating Systems: Internals and Design Principles, Prentice Hall.

Web references, journals and other:

http://williamstallings.com/OS/OS6e.html

Further Details:

This module will run over one semester, with three contact hours per week. Two hours for lectures and one hour for practical work.

Date of Academic Council approval ……