CO2017 Operating Systems, Networks and Distributed Systems

Credits: *20* **Convenor:** *Dr. G. Laycock* **Semester:** *2nd*

Prerequisites:	*Essential: CO1003* *Desirable: CO1005,CO1016,CO1018*
Lectures:	*30 hours*
Surgeries:	*10 hours*
Laboratories:	*20 hours*
Independent Study:	*90 hours*
Assessment:	*Coursework: 40% + Three hour exam in May/June: 60%*

Subject Knowledge

Aims To understand the role, structure and basic design of computer operating systems; the fundamental theory and practice of networks; and the theory and design of systems distributed through the use of networks.

Learning Outcomes Students should be able to: describe the fundamentals of current computer operating systems, and communications between computers; to use the Unix operating system; describe key operating system features such as processes, threads, scheduling and synchronization, memory and file-system management; solve simple problems concerning the benefits and costs of distribution of computer systems; give detailed accounts of the structure and organization of network hardware and software; describe the common physical attributes of networks.

Methods Class sessions together with recommended textbooks, lab practicals, worksheets, web support.

Assessment Marked lab practicals, marked coursework, traditional written examination.

Skills

Aims To teach students scientific writing, problem solving and information handling skills.

Learning Outcomes Students will be able to: write short, clear summaries of technical knowledge; solve abstract and concrete problems (both routine seen, and simple unseen), including numerical data; locate and access information.

Methods Class sessions together with worksheets, lab practicals.

Assessment Marked lab practicals, marked courseworks, traditional written examination.

Explanation of Prerequisites

Some knowledge of Java programming and of hardware is required.

Module Description

An operating system forms the interface between the computer's hardware and the user; examples include Windows NT (and subsequent versions), Linux (and other versions of Unix), and MacOS. The operating system has many tasks, such as: managing processes, allocating processor time between different processes; allocating the memory between different processes; organizing input and output; and managing files. The operating system is responsible for protecting the user from other users, and where possible from himself/herself. The *Operating Systems* part of the module explains how these tasks are carried out in modern computers, and the details of why it is desirable to link together distributed systems to form a single unit.

Linking computers so they may communicate is very much a part of modern life, with the ever-rising popularity of the Internet and the World Wide Web. In the *Networks* part of the course we will study the science underpinning such communications. Topics of interest will include the underlying physical media, the way data is represented, how errors in transmission can be detected and dealt with, the way information is routed over a large network, and the details of some actual networks which yield distributed computing systems.

Syllabus

Operating systems/Distributed systems

Introduction Overview; interrupts.

Process management Programs and processes; multitasking; dispatcher; scheduling and scheduling policies; interprocess communication, in particular joint access to shared resources; threads; Java thread programming.

Memory management Memory allocation methods; paging; virtual memory; segmentation; protection and sharing.

File management Concept of file; directory structure; file management techniques; directory implementation.

Networks

Introduction Overview; different sorts of networks; layered protocols.

The Physical Layer A short overview.

The Data Link Layer Error detection and correction; flow control; channel allocation; protocols for local area networks; bridges.

The Network Layer Datagrams and virtual circuits; routing; congestion control; internetworking; the network layer in the Internet.

The Transport Layer Connection management; transport layer in the Internet; congestion control; socket concept; Java socket programming.

The Application Layer Domain name system; E-mail system.

Reading List

[A] Andrew S. Tanenbaum, *Modern Operating Systems,* Prentice Hall, 2001. ISBN 0130313580.

[A] Andrew S. Tanenbaum, *Computer Networks,* Prentice Hall, 2003. ISBN 0130661023.

[A] Herbert Schildt, *Java2: the complete reference,* McGraw-Hill Osborne Media, 2006. ISBN-10: 0072263857.

Resources Study guide, computer lab, lecture rooms, worksheets, handouts, web page, course notes.

Module Evaluation Course questionnaires, course review.