CO2017 Operating Systems, Networks and Distributed Systems

Credits: 20  Convenor: Dr. S. Yang  Semester: 2nd

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

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; 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, and (some) additional hand-outs and 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 coursework, traditional written examination.

Explanation of Prerequisites  Some knowledge of Java programming and of hardware is required.

Course Description  An operating system forms the interface between the computer’s hardware and the user; examples include Windows NT, 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.

Detailed Syllabus

Operating systems/Distributed systems
Introduction  Overview; history; hardware features; interrupts; kernal mode.
User interface  Model of user interface; system calls; command language; job control language; GUI.
Process management  Programs and processes; multitasking; dispatcher; scheduling and scheduling policies.
Memory management  Memory allocation methods; paging; virtual memory; segmentation; protection and sharing.
Input/output  Characteristics of I/O devices; organization of I/O system; buffering.
File management  Concept of file; directory structure; file management techniques; directory implementation.
Concurrent programming  Thread; facilities for synchronization; interprocess communication; Java thread programming.

Networks

Introduction  Overview; different sorts of networks; layered protocols.
The Physical Layer  Transmission media; representing binary data.
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


Resources  Course notes, web page, study guide, computer lab, worksheets, handouts, lecture rooms with two OHPs, past examination papers.

Module Evaluation  Course questionnaires, course review.