



VIETNAM NATIONAL UNIVERSITY OF HO CHI MINH CITY  
UNIVERSITY OF NATURAL SCIENCES  
FACULTY OF INFORMATION TECHNOLOGY

**COURSE SYLLABUS**

<b>Course Code:</b>	TH111
<b>Title:</b>	Advanced Operating Systems
<b>Credits:</b>	4
<b>Workload:</b>	Lecture hours: 3 periods * 15 weeks = 45 periods Laboratory hours: 2 periods * 15 weeks = 30 periods Preparative hours:
<b>Prerequisites:</b>	TH012 - Intermediate Programming A2 TH101 - Computer Architecture TH106 - Operating Systems

**Course Objectives:**

This course aims to provide the students with essential concepts of a modern operating system. Topics include problems about designing a multitasking operating system, design principles and models for an operating system, mechanisms and strategies for process scheduling and process synchronization, memory management models, and mechanisms of protection and security. After the course, students will also understand and be able to use most of the popular operating systems (Windows family, Unix, Linux...) under the points of view of Users, Programmers, and Designers.

**Main Text:** *Lecture notes on Advanced Operating Systems* (in Vietnamese)  
Trần Hạnh Nhi, Faculty of Information Technology, University of Natural Sciences, Vietnam National University of Hochiminh City, 1998/2002.

**References:**

- *An Introduction to Operating Systems*, Harvey Deitel, Addison Wesley, 1994.
- *Concurrent Program Structures*, David Bustard, John Elder & Jim Welsh, Prentice Hall, 1984.
- *Modern Operating Systems*, Andrew S. Tanebaum, Prentice Hall, 1994.
- *Operating System Concepts*, Abraham Silberschatz & Perter B.Galvin, Addison Wesley, 1994/2002.
- *Applied Operating Systems Concepts*, A. Silberschatz, P. B. Galvin, and G. Gagne, 1st Edition, John Wiley & Sons, 2000.
- *Lecture notes on Operating Systems*, Lê Khắc Nhiên Ân, Faculty of Information Technology, University of Natural Sciences, Vietnam National University of Hochiminh City, 1997.

**Course Outline:**

Chapter 1 Overview

- 1.1 Functionalities of Operating Systems
- 1.2 Components of Operating Systems
- 1.3 Structures of an Operating System

## Chapter 2 Process Management

- 2.1 Introduction to Processes
  - 2.1.1 Process Model
  - 2.1.2 Process States
  - 2.1.3 Process Execution Modes
  - 2.1.4 Process Control Block
  - 2.1.5 Operations on Processes
  - 2.1.6 Resource Allocations for Processes
- 2.2 Threads
- 2.3 Process Scheduling
  - 2.3.1 Introduction
  - 2.3.2 Organizations of Scheduling
  - 2.3.3 Scheduling Strategies
    - 2.3.3.1 . FIFO
    - 2.3.3.2 . SJF
    - 2.3.3.3 . RoundRobin
    - 2.3.3.4 . Scheduling with priorities
    - 2.3.3.5 . Multilevel Feedback

## Chapter 3 Interprocess Communication

- 3.1 Introduction
  - 3.1.1 The needs for interprocess communication
  - 3.1.2 Problems of interprocess communication
- 3.2 Communication Mechanisms
  - 3.2.1 Signals
  - 3.2.2 Pipes
  - 3.2.3 Shared Memory
  - 3.2.4 Messages
  - 3.2.5 Sockets
- 3.3 Process Synchronization
  - 3.3.1 Introduction
  - 3.3.2 Solutions
  - 3.3.3 Classic problems of synchronization
- 3.4 Deadlocks

## Chapter 4 Memory Management

- 4.1 The problem
- 4.2 Current Conditions
- 4.3 Logical versus Physical Address Space
- 4.4 Contiguous Allocation
  - 4.4.1 Mono-program Systems
  - 4.4.2 Multi-program Systems with Fixed Partitions
  - 4.4.3 Multi-program Systems with Variable Partitions
  - 4.4.4 Multi-program Systems with “Swapping”
- 4.5 Non-contiguous Allocation

- 4.5.1 Paging
- 4.5.2 Segmentation
- 4.5.3 Segmentation with Paging
- 4.6 Virtual Memory
  - 4.6.1 Introduction
  - 4.6.2 Definition
  - 4.6.3 Implementation of Virtual Memory
  - 4.6.4 Page Replacement
  - 4.6.5 Demand Paging
  - 4.6.6 Page-Replacement Algorithms
  - 4.6.7 Allocation of Frames
  - 4.6.8 Thrashing
  - 4.6.9 Working-Set Model
  - 4.6.10 Page-Fault Frequency
  - 4.6.11 Other Considerations

## Chapter 5 Protection and Security

- 5.1 Goals of Protection
- 5.2 Domain of Protection
  - 5.2.1 Concept
  - 5.2.2 Domain Structure
- 5.3 Access Matrix
- 5.4 Implementation of Access Matrix
- 5.5 Security
  - 5.5.1 The Security Problem
  - 5.5.2 Authentication
  - 5.5.3 Program Threats
  - 5.5.4 System Threats
  - 5.5.5 Threat Monitoring

### **Grading**

Final exam : 70%

Assignments: 30%