

COMPUTER ARCHITECTURE

1. Thông tin về học phần (General Information)

Tên học phần (Course name): Computer Architecture

Mã học phần (Course code): INT1323

Số tín chỉ (Number of credits): 3

Loại học phần (Course type): Compulsory

Học phần tiên quyết (Prerequisites):

Học phần trước (Previous courses):

Học phần song hành (Parallel courses):

Các yêu cầu đối với học phần (Course requirements):

- Lecture room: Projector, microphone and speaker.
- Laboratory:

Giờ tín chỉ đối với các hoạt động (Teaching and Learning hours):

- Lý thuyết (Lectures): 30h
- Bài tập (Exercises): 7h
- Bài tập lớn (Projects): 8h
- Thực hành (Labs): 0h
- Tự học (Individual reading): 0h

Địa chỉ Khoa/Bộ môn phụ trách học phần (Address of the Faculty/Department in charge of the course):

- Address: Faculty of Information Technology 1 - Posts and Telecommunications Institute of Technology, Km10, Nguyen Trai Street, Ha Dong District, Hanoi.
- Phone number: (024) 33510432

2. Mục tiêu học phần (Objectives)

Về kiến thức (Knowledge):

The aim of this course is to provide students with the fundamental knowledge of computer architectures and organizations, including:

- CPU and CPU components, computer instruction sets, CPU pipeline;
- memory system and its components (ROM, RAM, Cache, external storage);
- computer bus system and peripherals;
- modern computer architectures (multi-processors and multicores).

Kỹ năng (Skills):

The aim of this course is to equip students with the capability in:

- analyzing architectures of computer systems in practice;
- selecting suitable types and configurations of computer systems for practical needs.

Thái độ, Chuyên cần (Attitude):

Students must ensure the required class attendance, assigned exercises & projects and self-studying hours.

3. Tóm tắt nội dung học phần (Description)

This course provides students with the fundamental knowledge of computer architectures and organizations, including the general computer architecture, CPU and CPU components, computer instruction sets, the CPU pipeline; the memory system and its components of ROM, RAM, cache, disks, RAID, NAS and SAN; the computer bus system and peripherals; modern computer architectures, such as multi-processors and multicores.

4. Nội dung chi tiết học phần (Outlines)

Chapter 1: Introduction

- 1.1. Computer architecture and computer organization
- 1.2. Computer structure and component functions
- 1.3. History of computers
- 1.4. Von-Neumann and Harvard architectures
- 1.5. x86, x64 and ARM architectures
- 1.6. Numbering systems and data organization in computers

Chapter 2: Central Processing Unit (CPU)

- 2.1. General block diagram and functional units
- 2.2. Registers
- 2.3. Control Unit (CU)
- 2.4. Arithmetic and Logic Unit (ALU)
- 2.5. Internal bus system

Chapter 3: Computer Instruction Sets

- 3.1. Basic concepts
- 3.2. Instruction cycle and execution phases
- 3.3. Types of operands
- 3.4. Addressing modes
- 3.5. Common types of instructions
- 3.6. CPU Pipeline

Chapter 4: Memory System

- 4.1. Introduction to memory system
 - 4.1.1. Overview
 - 4.1.2. Memory system classification
 - 4.1.3. Memory system hierarchical structure
- 4.2. ROM and RAM
 - 4.2.1. ROM
 - 4.2.2. RAM
- 4.3. Cache memory
 - 4.3.1. What is cache?
 - 4.3.2. Cache roles and working principles
 - 4.3.3. Cache architectures
 - 4.3.4. Cache mapping methods
 - 4.3.5. Read/write methods and replacement policies
 - 4.3.6. Cache performance and affected factors
- 4.4. External memory
 - 4.4.1. Magnetic disks
 - 4.4.2. Optical disks
 - 4.4.3. SSD
 - 4.4.4. RAID
 - 4.4.5. NAS
 - 4.4.6. SAN

Chapter 5: Bus System and Peripherals

- 5.1. Bus system
 - 5.1.1. Overview
 - 5.1.2. Common types of buses
- 5.2. Computer peripherals
 - 5.2.1. Overview
 - 5.2.2. Keyboards
 - 5.2.3. Mice
 - 5.2.4. Monitors
 - 5.2.5. Printers

Chapter 6: Modern Computer Architectures

- 6.1. Multiple processor architectures
- 6.2. Multicore processor architectures
- 6.3. Intel multicore processors
- 6.4. ARM Cortex multicore processors

5. Học liệu (Textbooks)

5.1. Học liệu bắt buộc (Required Textbooks)

- [1] William Stallings, Computer Organization and Architecture: Designing for Performance, 10th Edition, Prentice – Hall, 2016.

5.2. Học liệu tham khảo (Optional Textbooks)

- [2] Hoàng Xuân Dậu, Bài giảng Kiến trúc máy tính, Học viện Công nghệ Bưu chính viễn thông, 2010.
- [3] Hennesy J.L. and Patterson D.A., Computer Architecture. A Quantitative Approach, Morgan Kaufmann, 6th Edition, 2017.
- [4] Mostafa Abd-El-Barr and Hesham El-Rewini, Fundamentals of Computer Organization and Architecture, John Wiley & Sons, Inc, 2005.

6. Phương pháp, hình thức kiểm tra – đánh giá kết quả học tập học phần (Grading Policy)

Grading method	Percentage	Group/Individual
- Attendance	10%	Individual
- Exercises	10%	Individual
- Mid-term projects/ exam	20%	Group or individual
- Final examination	60%	Individual

Trưởng Bộ môn
(Head of Department)

Giảng viên biên soạn
(Lecturer)

Ngô Xuân Bách

Hoàng Xuân Dậu