ITT Technical Institute

CE2530

Computer Communications

Onsite and Online Course

SYLLABUS

Credit hours: 4.5

Contact/Instructional hours: 56 (34 Theory Hours, 22 Lab Hours)

Prerequisite(s) and/or Corequisite(s):

Prerequisite: ET1220 Digital Fundamentals or equivalent

Course Description:

In this course, students study the architecture of the computer. The basics of digital logic and data representations are explored. Students learn the basics of computer hardware including processors, memory, and input/output devices

COURSE SUMMARY

COURSE DESCRIPTION

In this course, students study the architecture of the computer. The basics of digital logic and data representations are explored. Students learn the basics of computer hardware including processors, memory, and input/output devices.

MAJOR INSTRUCTIONAL AREAS

1. Basics of digital logic, gates, and data representation
2. Processors
3. Memories
4. Input/output systems
5. Parallelism, pipelining, and performance

COURSE LEARNING OBJECTIVES

1. Explain the general functions and structure of a digital computer, including computer memory systems, memory hierarchy, semiconductor RAM/ROM, magnetic disks, flash memory and various I/O modules.
2. Describe the key performance issues that relate to computer design.
3. Summarize the key functions of an operating system.
4. Explain the basic concepts and terminology of positional number systems including decimal, binary, and hexadecimal, and discuss algorithms used for the binary arithmetic operations.
5. Explain the basic operations of Boolean algebra.
6. Explain essential characteristics of machine instructions.
7. Describe the various types of addressing modes common in instruction sets.
8. Explain the basic elements of an instruction cycle, discuss the role of interrupts, and describe how instruction pipelining works in practice.

COURSE OUTLINE

MODULE 1: COMPUTER STRUCTURE AND PERFORMANCE ISSUES

COURSE LEARNING OBJECTIVES COVERED

- Explain the general functions and structure of a digital computer, including computer memory systems, memory hierarchy, semiconductor RAM/ROM, magnetic disks, flash memory and various I/O modules.
- Describe the key performance issues that relate to computer design.

TOPICS COVERED

- Basic Concepts and Computer Evolution
- Performance Issues

MODULE LEARNING ACTIVITIES	GRADED	OUT-OF-CLASS TIME
Reading: *Computer Organization and Architecture: Designing for Performance, Chapters 1 and 2*	No	8 hrs
Lesson: Study the lesson for this module.	No	1 hr
Discussion: Participate in the discussion titled "Effectiveness of Multicore Structure."	Yes	N/A
Exercise: Submit the exercise titled "Performance Issues."	Yes	2 hrs

Total Out-Of-Class Activities: 11 Hours

MODULE 2: THE COMPUTER SYSTEM MEMORY

COURSE LEARNING OBJECTIVES COVERED

- Explain the general functions and structure of a digital computer, including computer memory systems, memory hierarchy, semiconductor RAM/ROM, magnetic disks, flash memory and various I/O modules.
- Explain the basic elements of an instruction cycle, discuss the role of interrupts, and describe how instruction pipelining works in practice.

TOPICS COVERED

- A Top-Level View of Computer Function and Interconnection
- Cache Memory
- Internal Memory
- External Memory

MODULE LEARNING ACTIVITIES	GRADED	OUT-OF-CLASS TIME
Reading: *Computer Organization and Architecture: Designing for Performance, Chapters 3-6*	No	14 hrs
Lesson: Study the lesson for this module.	No	2 hrs
Discussion: Participate in the discussion titled "Types of Memory."	Yes	N/A
Lab 1: Complete the lab titled "Cache Size."	Yes	N/A
Lab 2: Complete the lab titled "Interleaved Memory Simulator."	Yes	N/A
Exercise: Submit the exercise titled "Functions of Memory."	Yes	1 hr
Quiz: Prepare for Quiz 1.	No	2 hrs

Total Out-Of-Class Activities: 19 Hours

MODULE 3: INPUT/OUTPUT DEVICES, ARITHMETIC, AND LOGIC

COURSE LEARNING OBJECTIVES COVERED

- Explain the general functions and structure of a digital computer, including computer memory systems, memory hierarchy, semiconductor RAM/ROM, magnetic disks, flash memory and various I/O modules.
- Summarize the key functions of an operating system.
- Explain the basic concepts and terminology of positional number systems including decimal, binary, and hexadecimal, and discuss algorithms used for the binary arithmetic operations.
- Explain the basic operations of Boolean algebra.
- Explain the basic elements of an instruction cycle, discuss the role of interrupts, and describe how instruction pipelining works in practice.

TOPICS COVERED

- Input/Output
- Operating System Support
- Number Systems
- Computer Arithmetic
- Digital Logic

MODULE LEARNING ACTIVITIES	GRADED	OUT-OF-CLASS TIME
Reading: *Computer Organization and Architecture: Designing for Performance, Chapters 7-11*	No	19 hrs
Lesson: Study the lesson for this module.	No	2 hrs
Discussion: Participate in the discussion titled "Input/Output Devices and Internal Processing."	Yes	N/A
Lab 1: Complete the lab titled "I/O System Design Tool."	Yes	N/A
Lab 2: Complete the lab titled "Arithmetic and Logic."	Yes	N/A
Quiz: Take Quiz 1.	Yes	N/A

Total Out-Of-Class Activities: 21 Hours

MODULE 4: THE CENTRAL PROCESSING UNIT

COURSE LEARNING OBJECTIVES COVERED

- Explain essential characteristics of machine instructions.
- Describe the various types of addressing modes common in instruction sets.
- Explain the basic elements of an instruction cycle, discuss the role of interrupts, and describe how instruction pipelining works in practice.

TOPICS COVERED

- Instruction Sets: Characteristics and Functions
- Instruction Sets: Addressing Modes and Formats
- Processor Structure and Function
- Reduced Instruction Set Computers

MODULE LEARNING ACTIVITIES	GRADED	OUT-OF-CLASS TIME
Reading: *Computer Organization and Architecture: Designing for Performance, Chapters 12-15*	No	16 hrs
Lesson: Study the lesson for this module.	No	2 hrs
Discussion: Participate in the discussion titled "Instruction Processing."	Yes	N/A
Lab 1: Complete the lab titled "CPU Lab."	Yes	N/A
Lab 2: Complete the lab titled "Loop Unrolling Lab."	Yes	N/A
Exercise: Submit the exercise titled "Functions of Instruction Set."	Yes	1.5 hrs
Quiz: Prepare for Quiz 2.	No	2 hrs

Total Out-Of-Class Activities: 21.5 Hours

MODULE 5: PARALLEL ORGANIZATION

COURSE LEARNING OBJECTIVES COVERED

- Explain the general functions and structure of a digital computer, including computer memory systems, memory hierarchy, semiconductor RAM/ROM, magnetic disks, flash memory and various I/O modules.
- Describe the key performance issues that relate to computer design.
- Explain essential characteristics of machine instructions.
- Describe the various types of addressing modes common in instruction sets.
- Explain the basic elements of an instruction cycle, discuss the role of interrupts, and describe how instruction pipelining works in practice.

TOPICS COVERED

- Instruction-Level Parallelism and Superscalar Processors
- Parallel Processing
- Multicore Computer
- General Purpose Graphic Processing Units

MODULE LEARNING ACTIVITIES	GRADED	OUT-OF-CLASS TIME
Reading: *Computer Organization and Architecture: Designing for Performance, Chapters 16-19.*	No	13 hrs
Lesson: Study the lesson for this module.	No	2 hrs
Discussion: Participate in the discussion titled "Parallel Processing in a Superscalar Machine."	Yes	N/A
Lab 1: Complete the lab titled "Parallelism and Superscalar Processors."	Yes	N/A
Lab 2: Complete the lab titled "Parallel Processing."	Yes	N/A
Quiz: Take Quiz 2.	Yes	N/A
Final Exam: Prepare for final exam.	No	5 hrs

Total Out-Of-Class Activities: 20 Hours

MODULE 6: THE CONTROL UNIT

COURSE LEARNING OBJECTIVES COVERED

- Explain the general functions and structure of a digital computer, including computer memory systems, memory hierarchy, semiconductor RAM/ROM, magnetic disks, flash memory and various I/O modules.
- Describe the key performance issues that relate to computer design.
- Summarize the key functions of an operating system.
- Explain the basic concepts and terminology of positional number systems including decimal, binary, and hexadecimal, and discuss algorithms used for the binary arithmetic operations.
- Explain the basic operations of Boolean algebra.
- Explain essential characteristics of machine instructions.
- Describe the various types of addressing modes common in instruction sets.
- Explain the basic elements of an instruction cycle, discuss the role of interrupts, and describe how instruction pipelining works in practice.

TOPICS COVERED

- Control Unit Operation
- Microprogrammed Control

MODULE LEARNING ACTIVITIES	GRADED	OUT-OF-CLASS TIME
Reading: *Computer Organization and Architecture: Designing for Performance, Chapters 20 and 21*	No	6.5 hrs
Lesson: Study the lesson for this module.	No	2 hrs
Discussion: Participate in the discussion titled "Processing of Hardwired and Microprogrammed Control."	Yes	N/A
Lab: Complete the lab titled "Control Processor Lab."	Yes	N/A
Final Exam: Take the final exam.	Yes	N/A

Total Out-Of-Class Activities: 8.5 Hours

EVALUATION CRITERIA

The graded assignments will be evaluated using the following weighted categories:

CATEGORY	WEIGHT
Exercise	15%
Lab	35%
Discussion	10%
Quiz	20%
Final Exam	20%
TOTAL	100%

GRADE CONVERSION

The final grades will be calculated from the percentages earned in the course, as follows:

GRADE		PERCENTAGE
A	(4.0)	90–100%
B+	(3.5)	85–89%
B	(3.0)	80–84%
C+	(2.5)	75–79%
C	(2.0)	70–74%
D+	(1.5)	65–69%
D	(1.0)	60–64%
F	(0.0)	<60%

LEARNING MATERIALS AND REFERENCES

REQUIRED RESOURCES

COMPLETE TEXTBOOK PACKAGE

- Stallings, W. (2016). *Computer Organization and Architecture: Designing for Performance (10th ed.). Hoboken, NJ: Prentice Hall.*

OTHER ITEMS

- Simulator software required for SMPCache lab

RECOMMENDED RESOURCES

- Books and Professional Journals
  - Comer, D.E. (2005). *Essentials of Computer Architecture. Pearson Prentice Hall*
- ITT Tech Virtual Library (accessed via Student Portal | https://studentportal.itt-tech.edu)
  - Basic Search
    - Robb, D. (2004). *Server disk management in a windows environment*. Florida: Auerbach Publications.
    - Singh, V. P. (2009). *Computer Hardware Course. Delhi: Global Media.*
    - Sharma, N. (2009). *Computer Architecture. New Delhi University Science Press.*
    - Patterson, D. (2007). *Computer Organization and Design: The Hardware/Software Interface. Elsevier.*
  - School of Information Technology
    - Tutorial Links:
      - Computer Science Tutorials
      - TechTutorials–Free Computer References
- Other References
  - CompTIA Certifications http://certification.comptia.org/home.aspx (Accessed June 9, 2015)
  - IEEE Computer Society http://www.computer.org/portal/web/guest/home (Accessed June 9, 2015)

INSTRUCTIONAL METHODS AND TEACHING STRATEGIES

The curriculum employs a variety of instructional methods that support the course objectives while fostering higher cognitive skills. These methods are designed to encourage and engage you in the learning process in order to maximize learning opportunities. The instructional methods include but are not limited to lectures, collaborative learning options, use of technology, and hands-on activities.

To implement the above-mentioned instructional methods, this course uses several teaching strategies, such as discussions that enable you to demonstrate your understanding of the subject and share opinions. You can use these discussions to build up your knowledge, share best practices, advancements, and solutions with the help of social learning methodology. The labs are provided to work as application-level learning events where you get hands-on practice of concepts and procedures. Altogether, the lessons in this course will focus on comprehension and application-level of learning. Your progress will be regularly assessed through a variety of assessment tools including exercise, lab, discussion, quiz, and final exam.

OUT-OF-CLASS WORK

For purposes of defining an academic credit hour for Title IV funding purposes, ITT Technical Institute considers a quarter credit hour to be the equivalent of: (a) at least 10 clock hours of classroom activities and at least 20 clock hours of outside preparation; (b) at least 20 clock hours of laboratory activities; or (c) at least 30 clock hours of externship, practicum or clinical activities. ITT Technical Institute utilizes a “time-based option” for establishing out-of-class activities which would equate to two hours of out-of-class activities for every one hour of classroom time. The procedure for determining credit hours for Title IV funding purposes is to divide the total number of classroom, laboratory, externship, practicum and clinical hours by the conversion ratios specified above. A clock hour is 50 minutes.

A credit hour is an artificial measurement of the amount of learning that can occur in a program course based on a specified amount of time spent on class activities and student preparation during the program course. In conformity with commonly accepted practice in higher education, ITT Technical Institute has institutionally established and determined that credit hours awarded

for coursework in this program course (including out-of-class assignments and learning activities described in the “Course Outline” section of this syllabus) are in accordance with the time-based option for awarding academic credit described in the immediately preceding paragraph.

ACADEMIC INTEGRITY

All students must comply with the policies that regulate all forms of academic dishonesty or academic misconduct. For more information on the academic honesty policies, refer to the Student Handbook and the School Catalog.

INSTRUCTOR DETAILS

Instructor Name	
Office Hours	
Contact Details	

(End of Syllabus)