The University of Jordan

School of Engineering

Computer Engineering Department

Fall Term 2018/2019

Course	Computer Design – 0907432 (3 Cr. – Core Course)
Catalog Description	Pipelining: Data and Control Hazards, Exceptions and Interrupts, Instruction Level Parallelism (ILP): Software and Hardware approaches for speculative execution, Case Studies of Modern Processors. Memory Hierarchy: Cache Design and Evaluation, Virtual Memory, Advanced Cache Technology, Input/Output Devices and Interface, Multiprocessors and Vector Processing, Shared and Distributed Memory Architectures. Graphics Processing.
Prerequisites by Course	Computer Organization (0907335)
Prerequisites by Topic	Students are assumed to have had sufficient knowledge pertaining to digital logic design, MIPS instruction set architecture, computer arithmetic, processor datapath and control design, single-cycle, multi-cycle, and pipelined implementations of processors.
Textbook	Patterson and Hennessy. Computer Organization & Design: The Hardware/Software Interface, 5th ed., Morgan Kaufmann, 2014.
References	1. Hennessy and Patterson, Computer Architecture: A Quantitative Approach, 5th ed., Morgan Kaufmann, 2011. 2. J. P. Shen and M. H. Lipasti. Modern Processor Design: Fundamentals of Superscalar Processors, Mc Graw Hill, 2005. 3. D. Culler and J.P. Singh with A. Gupta. Parallel Computer Architecture: A Hardware/Software Approach, Morgan Kaufmann, 1998. 4. J. Hayes. Computer Architecture and Organization, 3rd ed., McGraw-Hill, 1998.
Course Website	http://www.abandah.com/gheith/?page_id=1982
Facebook group	https://www.facebook.com/groups/549894571732525/
Schedule & Duration	15 Weeks, 45 lectures, 50 minutes each (including exams) Or 8 weeks, 32 lectures, 75 minutes each
Student Material	Textbook, class handouts, some instructor keynotes, and any additional reading assigned by the instructor.
College Facilities	Classroom with whiteboard and projection display facilities, library, and computer laboratory.
Course Objectives	The objectives of this course are: 1. Introduce students to the technological changes in designing and building processors and computers. 2. Introduce students to the advanced techniques used in modern processors including pipelining, branch prediction, dynamic and speculative execution, multiple issue, multithreading, and software optimizations. 3. Introduce the students to the basic concepts and technologies used in designing memory and storage systems including cache, main memory, virtual memory, and secondary memory. 4. Introduce the students to the various approaches in parallel processing

including SIMD extensions, vector processors, GPUs, multicore processors, shared memory multiprocessors, clusters, and message-passing multi-computers.

Course Outcomes and Relation to ABET Program Outcomes

Upon successful completion of this course, a student should be able to:

1. Understand and analyze the performance of single-processor architectures, as well as multiprocessor architectures [a].
2. Understand and analyze the performance of memory hierarchy levels [a].
3. Understand the technological improvements and the effect of these improvements on modern computers [h].
4. Survey research papers that describe contemporary issues in computer design [i, j].

Course Topics

1. Introduction
2. Computer Technology and Performance (Sections 1.5–1.11)
3. Processor: Instruction-Level Parallelism (Sections 4.5–4.15)
4. Memory Hierarchy (Sections 5.1–5.16)
5. Parallel Processors (Sections 6.1–6.14)

Computer Usage

Practical aspects of the course are covered in Computer Design Lab 0907439.

Important Dates

Date	Event
Mon 10 Sep, 2018	Classes Begin
Wed 3 Oct, 2018	Quiz 1
Mon 5 Nov, 2018	Midterm Exam
Wed 12 Dec, 2018	Project Report Due
Web 19 Dec, 2018	Last Lecture
Dec 22 – 31, 2018	Final Exam Period

Policies

- Attendance is required. Class attendance will be taken every class and the university's polices will be enforced in this regard.
- All submitted work must be yours
- Cheating will not be tolerated
- Open-book exams
- Join the Facebook group of this course
- Check department announcements at: http://www.facebook.com/pages/Computer-Engineering-Department/369639656466107 for general department announcements.

Assessments

Quizzes and exams

Grading policy

One Quiz	15%
Technology Trends Research Project	15%
Midterm Exam	30%
Final Exam	40%

Instructors

Prof. Gheith Abandah, abandah@ju.edu.jo
Homepage: http://www.abandah.com/gheith
Office Hours: Tue & Thu: 11:00 – 12:00
Mon & Wed: 11:00 – 12:00

Class Time and Location

Section 1: Mon and Wed: 9:30–11:00, CPE 001

Last Updated: Sep 3, 2018

Program Outcomes (PO)

a	An ability to apply knowledge of mathematics, science, and engineering
b	An ability to design and conduct experiment as well as to analyze and interpret data.
c	An ability to design a system, component, or process to meet desired needs , within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
d	An ability to function on multidisciplinary teams
e	An ability to identify, formulate, and solve engineering problems
f	An understanding of professional and ethical responsibility.
g	An ability to communicate effectively
h	The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
i	A recognition of the need for, and an ability to engage in life-long learning
j	Knowledge of contemporary issues
k	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice