



<b>Course</b>	Computer Design – 0907432 (3 Cr. – Core Course)
<b>Catalog Description</b>	Exploiting instruction level parallelism, hardware and software approaches. Pipelined, Vector, Super scalar, and VLIW processors. Predication, Branch Prediction, and Control and Data Speculation. Case Studies of Modern Processors. Hierarchical Memory Design. Virtual memory. Input/Output Interfacing and System Integration. Introduction to Parallel Processing. Flynn’s classification. Symmetric Multiprocessors. Cache coherence.
<b>Prerequisites by Course</b>	Computer Organization (0907335)
<b>Prerequisites by Topic</b>	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.
<b>Textbook</b>	Patterson and Hennessy. Computer Organization & Design: The Hardware/Software Interface, 5th ed., Morgan Kaufmann, 2014.
<b>References</b>	<ol style="list-style-type: none"><li>1. Hennessy and Patterson, Computer Architecture: A Quantitative Approach, 5th ed., Morgan Kaufmann, 2011.</li><li>2. D. Culler and J.P. Singh with A. Gupta. Parallel Computer Architecture: A Hardware/Software Approach, Morgan Kaufmann, 1998.</li><li>3. J. Hayes. Computer Architecture and Organization, 3rd ed., McGraw-Hill, 1998.</li></ol>
<b>Course Website</b>	<a href="http://www.abandah.com/gheith/?page_id=1191">http://www.abandah.com/gheith/?page_id=1191</a>
<b>Facebook group</b>	<a href="https://www.facebook.com/groups/549894571732525/">https://www.facebook.com/groups/549894571732525/</a>
<b>Schedule &amp; Duration</b>	15 Weeks, 45 lectures, 50 minutes each (including exams) Or 8 weeks, 32 lectures, 75 minutes each
<b>Student Material</b>	Text book, class handouts, some instructor keynotes, and access to a personal computer and the internet.
<b>College Facilities</b>	Classroom with whiteboard and projection display facilities, library, and computer laboratory.
<b>Course Objectives</b>	The objectives of this course are: <ol style="list-style-type: none"><li>1. Introduce students to the technological changes in designing and building processors and computers.</li><li>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.</li><li>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.</li><li>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 multicomputers.</li></ol>

**Course Outcomes  
and Relation to ABET  
Program Outcomes**

- Upon successful completion of this course, a student should be able to:
1. Calculate the performance of processors and memories of various modern and high-performance designs [a].
  2. Design memory hierarchy to meet desired performance within economic and power constraints [c].
  3. Understand the technological improvements and the effect of these improvements on emerging computers, communication means, and personal mobile devices [h, 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**

<u>Date</u>	<u>Event</u>
Sun 21 Jun, 2015	Classes Begin
Mon 6 Jul, 2015	Quiz 1
Mon 20 Jul, 2015	Midterm Exam
Mon 3 Aug, 2015	Quiz 2
Wed 12 Aug, 2015	Last Lecture
Aug 15 – 17, 2015	Final Exam Period

**Policies**

- Attendance is required. Class attendance will be taken every class and the university’s policies 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**

Two Quizzes	20%
Midterm Exam	30%
Final Exam	50%

**Instructors**

**Dr. Gheith Abandah**, [abandah@ju.edu.jo](mailto:abandah@ju.edu.jo)  
**Homepage:** <http://www.abandah.com/gheith>  
**Office Hours:** Sun & Tue: 12:30 – 1:30  
Mon & Wed: 10:00 – 11:00

**Class Time and  
Location**

Section 1: Sun thru Wed: 11:00–12:30, Civil 002  
*10:20–12:20 in Ramadan*

**Last Updated:** Jun 18, 2015

## Program Outcomes (PO)

<b>a</b>	An ability to apply knowledge of mathematics, science, and engineering
<b>b</b>	An ability to design and conduct experiment as well as to analyze and interpret data.
<b>c</b>	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.
<b>d</b>	An ability to function on multidisciplinary teams
<b>e</b>	An ability to identify, formulate, and solve engineering problems
<b>f</b>	An understanding of professional and ethical responsibility.
<b>g</b>	An ability to communicate effectively
<b>h</b>	The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
<b>i</b>	A recognition of the need for, and an ability to engage in life-long learning
<b>j</b>	Knowledge of contemporary issues
<b>k</b>	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice