

The University of Jordan
School of Engineering
Computer Engineering Department
Spring Term 2022/2023



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| Course | Computer Architecture and Organization (2) – 0917432 (3 Cr. – Core Course) |
| Catalog Description | Exploiting instruction level parallelism, hardware and software approaches. Pipelined, 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. |
| Prerequisites by Course | Computer Architecture and Organization (1) – (0917335) |
| Prerequisites by Topic | Students are assumed to have had sufficient knowledge pertaining to digital logic design, RISC-V 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 RISC-V Edition: The Hardware/Software Interface, Second ed., Morgan Kaufmann, Elsevier Inc., 2021. |
| References | <ol style="list-style-type: none">1. Hennessy and Patterson, Computer Architecture: A Quantitative Approach, 6th ed., Morgan Kaufmann, Elsevier Inc., 2017.2. 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=3019 |
| Microsoft Teams | Link |
| Schedule & Duration | 15 Weeks, 43 lectures, 50 minutes each Or 31 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: <ol style="list-style-type: none">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, 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. |

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 [1].
 2. Understand and analyze the performance of memory hierarchy levels [1].
 3. Understand the technological improvements and the effect of these improvements on modern computers [4].
 4. Survey research papers that describe contemporary issues in computer design [3, 4, 7].

Course Topics

1. Introduction
2. Computer Technology and Performance (Sections 1.2, 1.5, 1.7–1.11)
3. Processor: Instruction-Level Parallelism (Sections 4.6–4.12, 4.15–4.16)
4. Memory Hierarchy (Sections 5.1–5.11, 5.13, 5.16–5.17)

Computer Usage

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

Important Dates

| Date | Event |
|-----------------|-----------------------|
| Mon 27 Feb 2023 | First Lecture |
| 16-30 Apr 2023 | Midterm Exam Period |
| Mon 29 May 2023 | Project Report Due |
| Sun 4 Jun 2023 | Last Date to Withdraw |
| Mon 5 Jun 2023 | Last Lecture |
| 8-20 Jun 2023 | Final Exam Period |

Policies

- Attendance is required. Class attendance will be taken every class and the university policies will be enforced in this regard.
- Be ready to participate in solving class problems.
- All submitted work must be yours.
- Cheating will not be tolerated.
- Open-book exams
- Check department announcements at: <http://www.facebook.com/pages/Computer-Engineering-Department/369639656466107> for general department announcements.

Assessments

Reports, participation, and exams

Grading policy

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|------------------------------------|-----|
| Two Quizzes | 10% |
| Technology Trends Research Project | 10% |
| Midterm Exam | 30% |
| Final Exam | 50% |

Instructors

Prof. Gheith Abandah, abandah@ju.edu.jo
Homepage: <http://www.abandah.com/gheith>
Office Hours: Sun through Thu: 13:00 am – 14:00 pm

Class Time and Location

Section 1: Mon and Wed: 8:30–10:00, CPE 001, [Microsoft Teams](#)

Last Updated

Feb 26, 2023

Program Outcomes (PO)

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| 1 | an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics |
| 2 | an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors |
| 3 | an ability to communicate effectively with a range of audiences |
| 4 | an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts |
| 5 | an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives |
| 6 | an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions |
| 7 | an ability to acquire and apply new knowledge as needed, using appropriate learning strategies. |