

Course number	ECE/CP SC 3810
Course title	Computer Organization
Required/elective	Elective for Electrical Engineering, required for Computer Engineering
Catalog description	An in-depth study of computer architecture and design, including topics such as RISC and CISC instruction set architectures, CPU organizations, pipelining, memory systems, input/output, and parallel machines. Emphasis is placed on performance measures and compilation issues.
Pre-requisite(s)	CS 2000 or 2420. Fulfills Quantitative Intensive BS
Textbook(s) and/or required material	<i>Computer Organization and Design</i> , 3rd edition (revised printing) by David Patterson and John Hennessy, ISBN: 978-0-12-370606-5
Course objectives	<p>While most computer science and electrical engineering students will not end up designing computers, computer organization and design will play a major role during their careers. Understanding the hardware/software interface is important during the design of both hardware and software because design decisions made by hardware designers have significant impact on software engineering.</p> <p>In this course we will explore the relationship between software and hardware, we will examine the design of modern computers, and we will place an emphasis on understanding computer performance.</p>
Topics covered	<p>The process of computing, MIPS Instruction Set Architecture I (arithmetic), MIPS ISA II (addressing and comparisons), SPIM simulator, MIPS ISA III (branches and procedures), MIPS examples in SPIM, C and the process of compiling, Number systems, low-level addition and subtraction, multiplication and division, Floating point representation and operations, Digital design basics, Arithmetic is logic, Designing a data path, Measuring computer performance, Single and multi-cycle CPU design, Pipelining I and II, Pipeline hazards, Memory systems and caches, Caches and virtual memory, Disk and I/O systems, contemporary topics.</p> <p>Students taking this class should be proficient in C++ or Java. Students should understand discrete math, binary, and should have a robust math background.</p>
Class schedule	15 weeks, two 80 minute sessions
Lab schedule	None. TAs on duty several hours per week to answer student questions
Contribution of course to meeting the requirements of ABET Criterion 5	The course teaches computer engineering science and some elementary computer engineering design.
Relationship to program outcomes	<p><i>MODERATE (a) An ability to apply mathematical, scientific, and engineering knowledge to solve electrical engineering problems.</i> The entire course emphasizes problem solving, using knowledge gained from previous computer programming classes, as well as information learned in this class.</p> <p><i>MODERATE (b) An ability to design and conduct experiments, as well as to analyze and interpret data.</i> Two assembly language programs are written, debugged, and tested.</p> <p><i>MODERATE (c) An ability to design an electrical engineering system,</i></p>

	<p><i>component, or process to meet desired needs.</i> Students must design simple digital systems, and they must write assembly language programs, all based upon written specifications.</p> <p><i>LIMITED (g) An ability to communicate technical information effectively in oral and written form.</i> All assignments are submitted in written form. A significant portion of the credit for the assembly language programs submitted for homework and exams is assigned to the comments.</p> <p><i>MODERATE (i) A recognition of the need for, and an ability to engage in, lifelong learning.</i> Several current papers are provided as part of required reading for the class, and students are encouraged to use the Internet to learn about current developments in this extremely dynamic subject area.</p> <p><i>MODERATE (j) An awareness of current events and trends affecting the electrical engineering profession.</i> Emphasis is placed throughout the course on changes in computer design and how they are influenced by various technical, economic, and social trends. The final lecture on current computer design issues is presented by a member of the Intel design team.</p> <p><i>MODERATE (k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.</i> A MIPS assembler and debugger are used for two of the ten homework assignments.</p>
Prepared by	Wilma Johnson & Course syllabus of Peter Jensen
Date	March 3, 2009