

SYLLABUS

COSC-520, Computer and System Architecture

spring 2015 (3 units)

Computer Science Department

Georgetown University

Lecture: 09:30-10:45 Tue/Thu Reiss 283

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COURSE DESCRIPTION:

This course is about the evolution of the design of computer systems and the factors shaping their hardware/software system architectures. We begin with a brief survey of information theory and physical information, models of computation, and trends in device and systems technology. We review basic basic electronics, computer system hardware architecture, implementation, organization, functionality, general features of instruction sets, parallel architectures, and general parallelism in both software and hardware. We look at some specific system architectures at various scales from embedded computer systems to warehouse computing. Topics include Turing Machines; Moore's Law; Amdahl's law; Flynn's taxonomy; silicon device properties; system power, performance, dependability, and cost; parallelism in processor architecture; memory hierarchies (cache and virtual memory); processor micro-architecture and pipelining; protection and sharing; I/O and interrupts and exceptions; in-order and out-of-order superscalar architectures; VLIW machines; vector supercomputers; multi-cores; clusters; multi-threaded architectures; symmetric multi-processors; parallel computational models and programming; GPU and special-purpose processors; reconfigurable logic and architectures; and warehouse-scale hardware, file systems, and computing. Grading: participation, 15%; midterm, 35%; final, 50%. Extra credit can be given for exceptional project development or other activities with instructor's permission.

Prerequisites: Expected background includes an understanding of computer systems from basic hardware organization through operating systems at the undergraduate level. Undergraduates may enroll with instructor's permission.

Required text: Patterson and Hennessy. *Computer Organization and Design, The Hardware/Software Interface*, 5th ed. ISBN 978-0-12-407726-3 . Morgan-Kaufmann, 2013.

Suggested text: Harris and Harris. *Digital Design and Computer Architecture*, 2nd ed.. ISBN 978-0-12394424-5. Morgan-Kaufman, 2012.

Optional text: Hennessy and Patterson. *Computer Architecture, A Quantitative Approach*, 5th ed. ISBN 978-0-12-383872-8. Morgan-Kaufman, 2012.

ACADEMIC INTEGRITY POLICY:

In assigning grades, one of my jobs as instructor is to ascertain your growth in understanding the intellectual content of the course during our studies together. Course assignments and projects are intended to facilitate that growth. However, at times, one's thinking can get lead astray by side-issues that may seriously hamper your efforts to understand. It is very important that you do not dwell fruitlessly on some point that has you stuck. You should seek help as soon as practical, and your classmates can be an efficient resource. For that reason, I encourage you to freely exchange information, and this Academic Integrity Policy is designed to allow for, and encourage that kind of cooperation. The default policy for the Computer Science Department is amended as follows. You are free to discuss problems and solutions of any assignment or project or exam with your classmates or others. You need not cite these conversations nor indicate which parts of your submitted material was garnered from such conversations. You are free to collect information from any source, electronic or otherwise, and you need not indicate the original source nor that the material did not originate with you. In addition, in this context, I consider it a fault to withhold useful information from others; although, this policy makes no stricture against it. The ability to work cooperatively together is a learned skill that will be important later in life, and sharing information is critical.

GRADING:

My grading system does not depend on evaluating your progress based on material of unknown origin. Homework is graded, but used solely to provide feedback, and not in determining grades (However, see class participation.) I do use your submitted material as a guide in developing examinations, and may ask that all your work be returned to me temporarily; so, keep ALL your work together as a portfolio. If you feel you are not being evaluated thoroughly enough, it is incumbent on you to bring this to my attention while there is still time to address your concerns before grades are submitted. You are welcome to discuss these issues with me at any time.

HOMEWORK MARKUP SYSTEM:

Homework grading should be thought of as a discussion, rather than a score. We mark up your work and return it to you. You can, and should if you feel it worth it, return your work with comments. I might then follow up in class or with additional comments, or you might follow up in class.

A check mark means:

"I mostly agree with what you said", "I cannot find anything worth quibbling about"

A "-" means :

"I think you are about 1/2 right", "There is something missing here, but not entirely wrong"

An "X" means:

"You did not answer the question", "The answer was too skimpy", "You basically missed the point"

A "?" means:

"I do not understand what you said", "Are you sure this makes sense?"

A "+" means:

"I like what I see", "You went beyond the call of duty", "Nice job".