

CS 613 Computer Architectures ♦ Spring 2018 Syllabus (01.27.2018 rev.)

Class Lecture Meeting Times: MW 11:20-12:40 pm (in TH N 306).

Instructor: Dr. Tim Newman

email: tnewman@cs.uah.edu

Office: TH N364

Phone: 824-6619

Fax: 824-6239

Office Hrs.: MW 2:00-3:15pm

T 1:00-3:15pm

R 10:00-11:00am

Prerequisites: CS 413/513 (also need working knowledge of basic probability and at least one simple assembly language program-writing and debugging experience)

Course Goals and Objectives: In this course, you will:

- Examine key computer architecture design issues, including instruction sets and their execution (such as via instruction-level parallelism, including moderately advanced issues in pipelining) and memory system design (especially cache-related issues).
- Examine some limitations of ILP and some ensuing matters.
- Examine basic performance evaluation concepts in modern systems.
- Study selected micro- and/or high-performance processing methods and some basic issues in multi-processing element systems, such as taxonomy, processor data coherence. Focus currently includes some data-parallel and thread-parallel issues in this arena. Interconnection considerations may possibly be considered as well.
- Practice collection, analysis, and/or experimentation of/on architectural knowledge from the literature, including *academically appropriate oral and written expression* of the learned knowledge.

As a result, after completing the course, you should **be familiar with these examined/studied items** and have **practiced** the architecture literature exercise.

Text: *Computer Architecture: A Quantitative Approach, 5th Ed.* by J. Hennessy and D. Patterson, 2012.

Grading Policies and Assessment: The professional judgment of the instructional staff will be used to grade each piece of work. The instructor strives for consistency in marking, which helps ensure reasonable fairness. The final grade will be composed of the following weights. The instructor reserves the right to make changes to this system, including the addition of unannounced (pop) quizzes.

Activity	Total Points
Mid-term Exams (2)	200 pts. total
Final Exam	125 pts.
Homeworks	40 pts. total
Project	35 pts. total
Participation	25 pts. total
Grand Total	425 pts.

The grading scale will be **no stricter than:**

At/Above 383 pts. for a 4.0;

At/Above 298 pts. for a 2.0;

Else: 0.0

At/Above 340 pts. for a 3.0;

Above 277 pts. (>65%) for a 1.0;

This course will utilize the plus/minus grading system for final grades. Note that a plus or minus grade doesn't effect GPA (e.g., a B is counted in GPA the same as a B- or B+).

Exams: There will be two mid-term examinations. These exams are scheduled for **Mon., Feb. 19** (N.B. REVISION!) and **Wed., March 21**. The 125 point comprehensive final will be at the time set by the University (currently listed as **Monday, April 30**, from 8:00 am to 10:30 am). Tests will cover lectures, assigned readings (textbook plus any assigned papers), projects and project presentations, and homeworks. Documented crisis or one week's prior notice required for *consideration* of exam make-up.

Pop Quizzes: The instructor reserves the right to use pop quizzes, so please keep up on the reading. If we have any pop quizzes, we'll adjust the grading schedule. You'll be told in class about any adjustment.

Project: The small project involves an approved investigation related to computer architecture. Some will involve reading one paper from the literature and making a tutorial presentation based on it. Others will involve investigating a topic by reading several papers and presenting a summarizing introduction to that topic. In either case, a short (approx. 10 minute) in-class presentation will be made. The presentation dates will be scheduled throughout the term to loosely coincide with the topics covered in the course. Some presentation dates are within the last two weeks of the term, so plan accordingly. Most project presentations will be presented by yourself. (N.B. May involve supplemental sessions (rev.)) On the day of your presentation, you will also be given a take-home question that you must answer **on your own** in writing and return by the start of the next class meeting period. That answer needs to identify all sources and *follow academic writing standards*.

Homeworks: Many homeworks will be assigned throughout the term. Some could be quite challenging and require deep thought. One or two of them are likely to be due during the last two weeks of classes. Homeworks are due at the start of class on the due date. **No late homeworks** will be accepted. Homework assignments must be your own work. Assignments must be organized such that the answers are ordered in the order the problems were assigned. Homework assignments will have a value of **40 units** each. One homework could be scored on a binary basis (for that homework, only an answer sheet will be distributed), and another could have a few problems scored on a binary basis. Your lowest homework mark will be dropped and the average of the remaining ones will taken as your Homework component score.

Turn-in Policy: Turn in your work to the instructor at the start of class, otherwise ahead of the due date during office hours. If you need to turn in your assignment at another time during the day, you may turn it in to one of the department secretaries during regular working hours (be sure to ask for the assignment to be time-stamped and given to Professor Newman). It is your responsibility to ensure that the secretary time stamps the assignment and receives clear direction to give the assignment to the instructor. **Do not turn in any work to a lab TA!**

Participation Policy and Absence: Class attendance and effective, constructive participation is important to your performance in the course and makes up a portion of the grade. If you cannot make it to class on the date something is due, please make arrangements to get your assignment to me before or at the start of class.

If you need help: I have scheduled a liberal amount of office hours and I want to help you learn the material and to succeed in the course. Please seek my assistance for your questions and concerns. The wait tends to be shortest at the start of office hours. Do note that office hours are first come, first served, and invariably will end at the posted end time; I advise against arriving in the last minutes of office hours if you have a burning question! Do note that some simple questions can be resolved by email or phone.

Academic Honesty: The University policy on academic honesty, discussed in the Code of Student Conduct, is strict. The instructor's academic honesty policy is very strict; instances of academic misconduct/dishonesty will be penalized, ordinarily by at least failure on the assignment and quite possibly by failure in the course (in addition to any University penalties).

Unless otherwise stated, all work is to be individual work. Moreover, doing work, especially homework, on your own is critical for you to develop your capabilities. Violations of the individual work policy will be regarded as instances of academic dishonesty. The Department also requires instructors to inform the Department of each instance of academic misconduct.

While *for the projects only* you will be allowed to read printed or electronic media of your choosing (this includes only items equally available to everyone—for example, books that can be checked out at the UAH library), any wording or phrasing that is directly borrowed (or even heavily paraphrased) in your oral presentation or in any written item you submit must be properly cited; whenever you are using someone else's material, you must identify exactly what is borrowed/paraphrased (i.e., using quotations) and to issue a citation. All usage of other's ideas and findings must also be properly identified. Copying without both quoting and citing is plagiarism. In particular, if you make a powerpoint presentation, all slides must be your own creation, excepting a small minority of your figures may be taken from other sources (with all such figures fully cited). Any work that does not follow these standards will receive a penalty, probably a failing grade; it is **unoriginal work**.

Department Policies: Please also see the department's course policy sheet. Note that it was made available the first day of classes.

Complaint Procedures: If you have difficulties or complaints related to this course, your first action usually should be to discuss them with the teacher. If such a discussion would be uncomfortable for you or fails to resolve your difficulties, you should contact Prof. Ranganath, Chair of the Department of Computer Science. His office is in the Tech Hall N 300 set of offices, his telephone number is 256-824-6088 and email address is ranganat@cs.uah.edu.

If you still are unsatisfied, you should discuss the matter with Dr. Emanuel Waddell, Associate Dean of the College of Science. The Associate Dean's office is MSB C206, telephone number is 256-824-6844 and email address is adeancos@uah.edu.

Also note the Student Handbook outlines in detail steps that are to be followed for considering course complaints.

Students with Disabilities: Your instructor would like to hear from anyone who has a disability that may require a modification of seating, testing, or other class procedures. Please see instructor after class or during office hours to discuss appropriate modifications. You should also contact Disability Support Services (which was in Wilson Hall 128) (Ph. 256-824-1997) for further assistance.

UAlert Emergency Notification System: UAHuntsville has implemented the UAlert emergency notification system. UAlert allows you to receive time-sensitive emergency messages in the form of e-mail, voice mail, and text messages.

Everyone who has a UAHuntsville e-mail address will receive emergency alerts to their campus e-mail address. In order to also receive text and voice message alerts, you are asked to provide up-to-date phone contact information. Participation in UAlert text and voice messaging is optional, but enrollment is strongly encouraged. **You can't be reached through UAlert unless you participate.** The information you supply is considered confidential and will not be shared or used for purposes other than emergency notification.

To review your UAlert account, add or update phone and alternate e-mail addresses, and set the priority for your contact methods, please visit the UAlert web site: <http://ualert.uah.edu>.

Spring 2018 CS 613(01) Tentative Schedule (Jan. 27, 2018 update)

Date	Topic	Reading Assignment	Special Comments
Mon. 1/8	Instruction Sets	App. A	
Wed. 1/10	Instruction Sets/ISAs	App. A	
Mon. 1/15	No Class		MLK Day Holiday
Wed. 1/17	Class postponed - weather		Weather Day
Mon. 1/22	ISAs and MIPS	App. A	
Wed. 1/24	MIPS	App. A	
Mon. 1/29	Caches, Memory Basics	App. B.1 - B.2	
Wed. 1/31	Computer Design	Ch. 1	
Mon. 2/5	Performance Measures	Ch. 1	
Wed. 2/7	Perf. Measures	Ch. 1	
Mon. 2/12	Perf. Measures	Ch. 1	
Wed. 2/14	Pipelining	App. C	
Mon. 2/19	TEST 1		TEST 1
Wed. 2/21	Adv. Pipelining	App. C	
Mon. 2/26	ILP	Ch. 3	
Wed. 2/28	ILP	Ch. 3	
Mon. 3/5	ILP	Ch. 3	
Wed. 3/7	ILP	Ch. 3	
Mon. 3/12	Memory/Cache Opt.	App. B.3-B.4, Ch. 2	
Wed. 3/14	Memory/Cache Opt.	Ch. 2	
Mon. 3/19	Memory/Cache Opt.	Ch. 2	
Wed. 3/21	TEST 2		TEST 2
Mon. 3/26	No Class	—	Spring Break
Wed. 3/28	No Class	—	Spring Break
Mon. 4/2	Data-level Par./Vector, Present.	Ch. 4	PRESENTATIONS
Wed. 4/4	Data-level Par./SIMD	Ch. 4	
Mon. 4/9	Data-level Par./ GPU	Ch. 4	
Wed. 4/11	Multiprocessing/TLP, Present.	Ch. 5	PRESENTATIONS
Mon. 4/16	Multi-processing/TLP	Ch. 5	
Wed. 4/18	Multi-processing/TLP	Ch. 5	
Mon. 4/23	Catch-up/Review, WSC (if time)	Ch. 6 (if time)	Presentations?
Wed. 4/25	No Class	—	Study Day
Mon. 4/30	FINAL	Chs. 1-6, Apps. A, B, C	FINAL 8:00am-10:30am