The University of Texas at Dallas
EE(CE) 6304 Computer Architecture 2016/2017
Course Syllabus

Time & Venue:

Lecture	Friday	4:30pm – 6:45pm	ECSS 2.201

Instructor:	Benjamin CARRION SCHAEFER
Email:	schaferb@utdallas.edu
Office:	ECSN 4.510
Telephone:	972-883-4531
Website:	www.utdallas.edu/~schaferb
Consultation hours:	Friday 2:30pm-4:30pm (use eLearning as much as possible)
Teaching Assistant:	TBD

Teaching and Learning Materials:

Lecture notes and other teaching and learning materials can be downloaded from **eLearning (https://elearning.utdallas.edu/)** Announcements on teaching and course administration issues will also be posted online.

Textbook:

[T1] Computer Architecture: A Quantitative Approach, 5th Edition, 2011, By John L. Hennessy & David A. Patterson, Morgan Kaufmann, ISBN: 978-0-12-383872-8

References:

[R1] Upgrading and Repairing PCs (22nd Edition), Scott Mueller, QUE

[R2] The X86 PC (5h Edition), By M. A. Mizidi, J. G.Mazidi and D. Causey

[R3] Learning Computer Architecture with Raspberry PI, E. Upton et al., Wiley

[R4] Modern Processor Design, By J. P. Shen and M Lipasti, Waveland Press. ISBN: 978-1-4786-0783-0

[R5] Computer Architecture, N. Carter, Shaum's Outlines ISBN 978-0-07-136207-8

Course Objectives

The objectives of this course are to understand fundamental computer design. At the completion of the course, the students should:

- Understand the fundamentals of the design and analysis of computers
- Appreciate the need of different memory hierarchies and their individual strengths and weaknesses.
- Learned about parallelism in computers. In particular
    - Data-level parallelism, including Instruction-level parallelism (ILP)
    - Task-level parallelism, including thread-level parallelism (TLP).
- Evaluate the ILP, TLP, reliability, and low-energy techniques and validate the design of various configurations of state-of-art architecture designs through a specific project using processor evaluation tools.
- Identify different bus structures in computers
- Understand current trends and the need for heterogeneous computer platforms
- Trends in supercomputers, data centers

Prerequisites

Undergraduate computer architecture and C programming

Assessments:

Continuous assessment (50%)

- Homework 20%
- 2 Group projects: 15% each = 30%

Examinations (50%) – Two exams

Examinations:

There will be two non-cumulative examinations for this course, each covering approximately half of the material. Both exams will be administered during regular class meeting times and will be graded by the instructor. Tentatively:

Exam #1: 2/24/2017 in class (ECSS 2.201)

Exam #2: 5/5/2017 in class (ECSS 2.201)

University Exam Guidelines:

1. When designing the questions of an examination paper, subject lecturers should set a **substantial** amount of marks for testing students' ability to **apply and elaborate** knowledge of the subject matter.
2. Subject lecturers are also encouraged to set question(s) which specifically test(s) students' **critical thinking** ability.

Homework:

After each lecture a problem set will be made available. Homework will be due in class by the end of the next lecture and will be graded by the Teaching Assistant.

Project:

Two projects will be assigned, involving an architectural simulation tool-set and programming in C. The projects will be carried out in teams of 2 students and will also be graded by the Teaching Assistant. Details about the projects will be provided as the semester progresses.

Solution Availability:

Solutions to homework problem sets will NOT be distributed. You can direct questions to the Teaching Assistant.

Collaboration Policy:

You are encouraged to talk to your classmates about the homework problem sets. However, the write-up *must be your own*. Similarly, you project team is encouraged to discuss the project assignment with other teams. However, the report must be written by each team *on its own.*

Re-grading Policy:

Sometimes you may disagree with the grades you receive. Since *to err is human*, it is possible that mistakes may occur during grading despite our efforts to prevent this. You may appeal the grade you receive in an examination, within ONE WEEK from the day it is made available to you. To request a homework or project re-grade contact the teaching assistant. To request an examination re-grade contact the instructor. After this one-week period grades will be assumed correct and final.

Getting Help:

The best way to help yourself with this course is to attend lectures.

There are several more ways to get help, preferably in the following order:

a) E-mail the Teaching Assistant or the instructor.

b) See the Teaching Assistant during office hours.

c) See the instructor during office hours.

PLEASE include EE6304 in the subject line of all e-mail correspondence.

Feedback:

If you have any concerns regarding the course, please inform the instructor early during the term so that a prompt effort to resolve them can be made. Comments and feedback are also solicited as early as possible. Finally, please do not hesitate to stop the instructor in class and ask questions or post them on Blackboard. Remember that if you have some question others may do too and will benefit from your input.

Requirements

Individual Participation & Professionalism

You are professionals and you will be expected to conduct yourselves accordingly. This means showing up on time, well prepared, having completed the required readings, and ready to contribute to each class, as you would for business meetings. Students may be called upon at random to initiate and/or make a contribution to the discussion of theory or exercises.

Lecture Schedule

Time **Venue**

4:00pm -6:45pm, Friday ECSS 2.201

Week	Activities	Topics	Reading Material	Book Chapter
1	Lecture 1	Introduction to computer architecture, computer organization, history	EE6304_intro.pdf	
2	Lecture 2	Metrics	EE6304_metrics.pdf	1
3	Lecture 3	Instruction Set Architecture	EE6304_isa.pdf	
5	Lecture 4	Pipelining, Instruction-Level parallelism, VLIW	EE6304_ilp.pdf	3
6	Lecture 5	Thread-level parallelism	EE6304_tlp.pdf	5
4	Lecture 6	Modern processor Types	EE6304_risc.pdf	
7		Mid-term		
8	Lecture 7	Memory hierarchy	EE6304_mem_hierarchy	2
9	Lecture 8	Secondary Memory	EE6304_mem_secondary	2
10	Lecture 9	Virtual Memory	EE6304_mem_virtual	2
11	Lecture 10	Buses	EE6304_buses.pdf	
12	Lecture 11	Supercomputers & Heterogeneous computing	EE6304_super_hetero.pdf	4-6
13	Lecture 12	Operating Systems	EE6304_os.pdf	
14		Final Exam Review		

UT Dallas Syllabus Policies and Procedures

The information below constitutes the University's policies and procedures segment of course syllabi, as described in http://go.utdallas.edu/syllabus-policies

Technical Support:

If you experience any problems with your UT Dallas account, you may email assist@utdallas.edu or call the UT Dallas Computer Help Desk at 972-883-2911.

Field Trip Policies, Off-Campus Instruction and Course Activities:

Off-campus, out-of-state, and foreign instruction and activities are subject to state law and University policies and procedures regarding travel and risk-related activities.
Information regarding these rules and regulations may be found at http://www.utdallas.edu/administration/risk/travel.php5. Additional information is available from the office of the school dean.

Student Conduct and Discipline:

The University of Texas System and The University of Texas at Dallas have rules and regulations for the orderly and efficient conduct of their business. It is the responsibility of each student and each student organization to be knowledgeable about the rules and regulations which govern student conduct and activities. General information on student conduct and discipline is contained in the UT Dallas printed publication, *A to Z Guide*, which is available to all registered students each academic year.

The University of Texas at Dallas administers student discipline within the procedures of recognized and established due process. Procedures are defined and described in the *Rules and Regulations, Series 50000*, Board of Regents, The University of Texas System, and in *Title V, Rules on Student Services and Activities* of the university's *Handbook of Operating Procedures*. Copies of these rules and regulations are available to students in the Office of the Dean of Students, where staff members are available to assist students in interpreting the rules and regulations (SU 1.602, 972/883-6391) and online at http://www.utdallas.edu/judicialaffairs/UTDJudicialAffairs-HOPV.html.

A student at the university neither loses the rights nor escapes the responsibilities of citizenship. He or she is expected to obey federal, state, and local laws as well as the Regents' Rules, university regulations, and administrative rules. Students are subject to discipline for violating the standards of conduct whether such

conduct takes place on or off campus, or whether civil or criminal penalties are also imposed for such conduct.

Students are expected to be attentive during class and to participate actively in group activities. Students are expected to listen respectfully to faculty and to other students who are speaking. Racism, sexism, homophobia, classism, ageism, and other forms of bigotry are inappropriate to express in class. Classes may discuss issues that require sensitivity and maturity. Disruptive students will be asked to leave and may be subject to disciplinary action.

Academic Integrity:

The faculty expects from its students a high level of responsibility and academic honesty. Because the value of an academic degree depends upon the absolute integrity of the work done by the student for that degree, it is imperative that a student demonstrate a high standard of individual honor in his or her scholastic work.

Scholastic Dishonesty: Any student who commits an act of scholastic dishonesty is subject to discipline. Scholastic dishonesty includes but is not limited to cheating, plagiarism, collusion, submitting for credit any work or materials that are attributable in whole or in part to another person, taking an examination for another person, or any act designed to give unfair advantage to a student or the attempt to commit such acts.

Plagiarism, especially from the web, from portions of papers for other classes, and from any other source, is unacceptable and will be dealt with under the university's policy on plagiarism (see general catalog for details). This course will use the resources of *turnitin.com*, which searches the web for possible plagiarism and is over 90% effective.

Copyright Notice:

The copyright law of the United States (*Title 17, United States Code*) governs the making of photocopies or other reproductions of copyrighted materials, including music and software. Copying, displaying, reproducing, or distributing copyrighted works may infringe upon the copyright owner's rights and such infringement is subject to appropriate disciplinary action as well as criminal penalties provided by federal law. Usage of such material is only appropriate when that usage constitutes "fair use" under the Copyright Act. As a UT Dallas student, you are required to follow the institution's copyright policy (UTDPP1043). For more information about the fair use exemption, see http://copyright.lib.utexas.edu/copypol2.html.

Email Use:

The University of Texas at Dallas recognizes the value and efficiency of communication between faculty/staff and students through electronic mail. At the same time, email raises some issues concerning security and the identity of each individual in an email exchange. The university encourages all official student email correspondence be sent only to a student's UT Dallas email address and that faculty and staff consider email from students official only if it originates from a UT Dallas student account. This allows the university to maintain a high degree of confidence in the identity of all individuals corresponding and the security of the transmitted information. UT Dallas furnishes each student with a free email account that is to be used in all communication with university personnel. The Department of Information Resources at UT Dallas provides a method for students to have their UT Dallas mail forwarded to other accounts.

Class Attendance:

Regular and punctual class attendance is expected. Students who fail to attend class regularly are inviting scholastic difficulty. Absences may lower a student's grade where class attendance and class participation are deemed essential by the instructor. In some courses, instructors may have special attendance requirements; these should be made known to students during the first week of classes.

Withdrawal from Class:

The administration of this institution has set deadlines for withdrawal from any college-level courses. These dates and times are published in that semester's course inventory and in the academic calendar. Administration procedures must be followed. It is the student's responsibility to handle withdrawal requirements from any class. In other words, a professor or other instructor cannot drop or withdraw any student. You must do the proper paperwork to ensure that you will not receive a final grade of "F" in a course if you choose not to attend the class once you are enrolled.

Student Grievance Procedures:

Procedures for student grievances are found in university policy UTDSP5005 (http://policy.utdallas.edu/utdsp5005). In attempting to resolve any student grievance regarding grades, evaluations, or other fulfillments of academic responsibility, it is the obligation of the student first to make a serious effort to resolve the matter with the instructor, supervisor, administrator, or committee with whom the grievance originated.

Incomplete Grade Policy:

As per university policy, incomplete grades will be granted only for work unavoidably missed at the semester's end and only if 70% of the course work has been completed. An incomplete grade must be resolved within eight (8) weeks from the first day of the subsequent long semester. If the required work to complete the course and to remove the incomplete grade is not submitted by the specified deadline, the incomplete grade is changed automatically to a grade of F.

Disability Service:

It is the policy and practice of The University of Texas at Dallas to make reasonable accommodations for students with properly documented disabilities. However, written notification from the Office of Student AccessAbility (OSA) is required. If you are eligible to receive an accommodation and would like to request it for a course, please discuss it with an OSA staff member and allow at least one week's advanced notice. Students who have questions about receiving accommodations, or those who have, or think they may have, a disability (mobility, sensory, health, psychological, learning, etc.) are invited to contact the Office of Student AccessAbility for a confidential discussion.

The primary functions of the Office of Student AccessAbility are to provide:

1. academic accommodations for students with a documented permanent physical, mental or sensory disability
2. non-academic accommodations
3. resource and referral information and advocacy support as necessary and appropriate.

OSA is located in the Student Services Building, suite 3.200. They can be reached by phone at (972) 883-2098, or by email at disabilityservice@utdallas.edu.

Religious Holy Days:

The University of Texas at Dallas will excuse a student from class or other required activities for the travel to and observance of a religious holy day for a religion whose places of worship are exempt from property tax under Section 11.20, Tax Code, *Texas Code Annotated*.

The student is encouraged to notify the instructor or activity sponsor as soon as possible regarding the absence, preferably in advance of the assignment. The student, so excused, will be allowed to take the exam or complete the assignment within a reasonable time after the absence: a period equal to the length of the absence, up to a maximum of one week. A student who notifies the instructor and completes any missed exam or assignment may not be penalized for the absence. A student who fails to complete the exam or assignment within the prescribed period may receive a failing grade for that exam or assignment.

If a student or an instructor disagrees about the nature of the absence [i.e., for the purpose of observing a religious holy day] or if there is similar disagreement about whether the student has been given a reasonable time to complete any missed assignments or examinations, either the student or the instructor may request a ruling from the chief executive officer of the institution, or his or her designee. The chief executive officer or designee must take into account the legislative intent of *TEC 51.911(b),* and the student and instructor will abide by the decision of the chief executive officer or designee.

Avoiding Plagiarism:

[Adapted from Duke University's guidelines for writers; added July 2010]

Take time to make careful choices among--and learn to use--the research tools available to you. You will probably find that your favorite web search engine is not adequate by itself for college-level research. Consult with your professor or a librarian. You may need to use specialized research tools, some of which may require learning new searching techniques.

Expect to make trips to the library. While you can access many of the library's resources from your home computer, you may find that you need to make several trips to use materials or research tools that are not accessible remotely. Of course, you will be seeking the best information, not settling for sources simply because they happen to be available online.

Allow time for gathering materials that are not available at UT Dallas. The InterLibrary Loan Office can borrow articles and books from other libraries, but this process takes additional time.

Allow time for reading, rereading, absorbing information, taking notes, synthesizing, and revising your research strategy or conducting additional research as new questions arise.

Sloppy note-taking increases the risk that you will unintentionally plagiarize. Unless you have taken note carefully, it may be hard to tell whether you copied certain passages exactly, paraphrased them, or wrote them yourself. This is especially problematic when using electronic source materials, since they can so easily be copied and pasted into your own document.

Identify words that you copy directly from a source by placing quotation marks around them, typing them in a different color, or highlighting them. (Do this immediately as you are making your notes. Don't expect to remember days or weeks later what phrases you copied directly.) Make sure to indicate the exact beginning and end of the quoted passage. Copy the wording, punctuation and spelling exactly as it appears in the original.

Jot down the page number and author or title of the source each time you make a note, even if you are not quoting directly but are only paraphrasing.

Keep a working bibliography of your sources so that you can go back to them easily when it's time to double-check the accuracy of your notes. If you do this faithfully during the note-taking phase, you will have no trouble completing the "works cited" section of your paper later on.

Keep a research log. As you search databases and consult reference books, keep track of what search terms and databases you used and the call numbers and URLs of information sources. This will help if you need to refine your research strategy, locate a source a second time, or show your professor what works you consulted in the process of completing the project.

You must cite direct quotes.

You must cite paraphrases. Paraphrasing is rewriting a passage or block of text in your own words. If you paraphrase, you must still cite the original source of the idea.

You must cite ideas given to you in a conversation, in correspondence, or over email.

You must cite sayings or quotations that are not familiar, or facts that are not "common knowledge." However, it is not necessary to cite a source if you are repeating a well known quote or familiar proverb. Common knowledge is something that is widely known. For example, it is widely known that Bill Clinton served two terms as president; it would not be necessary to cite a source for this fact.

These types of sources should be cited as well. *Printed sources*: Books, parts of books, magazine or journal articles, newspaper articles, letters, diaries, public or private documents; *Electronic sources*: Web pages, articles from e-journals, newsgroup postings, graphics, email messages, software, databases; *Images*: Works of art, illustrations, cartoons, tables, charts, graphs; *Recorded or spoken material*: Course lectures, films, videos, TV or radio broadcasts, interviews, public speeches, conversations.

Resources to Help You Succeed

The GEMS Center (located within the Conference Center) provides a wide array of free academic support and enhancement for UT Dallas undergraduate students. Offerings include, but are not limited to, a Math Lab and Writing Center, Peer Tutoring (with a focus on science, technology, engineering and math courses), test review sessions, and academic success coaching. The current menu of services, schedules, and contact information is posted on the GEMS website: http://www.utdallas.edu/ossa/gems/.