

Instructor(s):

Name: David Tarnoff

Office: Room 4-469, [Roy S. Nicks Hall](#)

Office Hrs: Monday: 1:35-2:35
Tuesday: 8:05-9:00
Wednesday: 1:35-2:35 and 6:30-7:30
Thursday: 8:05-9:00 and 1:35-2:45
or by appointment

Phone: [423.439.6404](tel:423.439.6404) (Office/voice mail)

e-mail: tarnoff@etsu.edu

Web page: This course uses [ETSU's D2L server](#) for on-line content.

BACK TO TOP

Course Details: Click on links to see the [syllabus attachment](#) provided by the [Office of the Registrar](#) regarding key dates and other information.

Course Number: CSCI 4717

Course Title: Computer Architecture

Meeting Times: Section 001: Tues/Thur 9:05 AM - 11:05 AM

Meeting Location: Class will meet every period in Nicks Room 320
Occasionally, lab or "Show & Tell" will be held in the Nicks 492 lab

Catalog Description: [Computer systems are viewed as consisting of a series of layers or levels one on top of another. Topics of computer architecture are presented. Microprogramming stack computers, parallel computers, pipeline processing, multiprocessors, virtual storage, cache storage, addressing schemes, and I/O and interrupt structure.](#)

Prerequisite: [CSCI 2160 \(Assembly Language\) and CSCI 2210 \(Data Structures\)](#)

Credit: [3 credit hours](#)

Outcomes: [We expect students completing this course to be able to:](#)

- [demonstrate an understanding of the organization and architecture of computer systems \(Student Outcomes 3, CS-1*\);](#)
- [demonstrate an understanding of the relationship of higher level, abstract ideas to the features of a machine's architecture \(Student Outcomes 3, CS-1*\);](#)
- [demonstrate an understanding of the issues that influence designs of programming languages, operating systems, databases, and algorithms \(Student Outcomes 4b, CS-2\);](#)
- [demonstrate an understanding of the concepts and techniques of constructing machines as a series of levels \(Multilevel Machines\) \(Student Outcomes 3, CS-1*\);](#)
- [demonstrate a basic understanding of some advanced topics, such as stack computers, parallel computers, overlap and pipeline processing, and performance evaluation \(Student Outcomes 3, 5c, CS-1*\); and](#)
- [demonstrate through both simulation and the development of performance measuring applications an understanding of how different architectures affect performance \(Student Outcomes 4b, 5c, CS-1*\).](#)

BACK TO TOP**Required Texts:**

[Every effort has been made to use on-line reference material for this course. Although the use of alternate resources may be necessary, the majority of the reading will come from the following references \(listed in order of importance\). If an alternate resource is required, it will be announced in class and posted to the D2L site.](#)

- **Tarnoff ACA** - Applied Computer Architecture by David Tarnoff. This document is still in development, so I will be providing web links as the material becomes available.
- **Hyde AoA** - The Art of Assembly Language by Randall Hyde.
URL: <http://homepage.mac.com/randyhyde/webster.cs.ucr.edu/www.artofasm.com/Windows/HTML/AoATOC.html>
- **MIPS PCSUM** - MIPS32® M4K™ Processor Core Software User's Manual from MIPS Technologies, Inc.
URL: <http://www.mips.com/secure-download/index.cfm?filename=MD00249-2B-M4K-SUM-02.02.pdf>
- **Britton MALP** - MIPS Assembly Language Programming by Robert Britton.

URL: ftp://ftp.prenhall.com/pub/esm/sample_chapters/cs/britton/index.html

- **Tarnoff CODF** - Computer Organization and Design Fundamentals by David Tarnoff.

URL: <http://www.lulu.com/content/138273>

[BACK TO TOP](#)

Course outline:

The course outline is presented below. The instructor has the right to alter the outline at any time due to time constraints, unexpected scheduling conflicts, or overall benefit to class effectiveness.

Week	Date	Topic	Reading
1	28-Aug	Intro to Computer Architecture and Moore's Law	Tarnoff ACA - Chapter 1
	30-Aug	Computing machinery history	Tarnoff ACA - Chapter 2
2	4-Sep	Operands and addressing modes	Tarnoff ACA - Chapter 3
	6-Sep	Operands (continued) and Stack	C. Lin, "Understanding the Stack"
3	11-Sep	Instruction set design and data alignment	Hyde AoA - Sections 5.2 - 5.3
	13-Sep	Case study: ARM Instruction Set	See D2L for On-line resource
4	18-Sep	Cache theory	Tarnoff CODF - Section 13.4
	20-Sep	Cache implementations	
5	25-Sep	Pipelining and branch prediction	Stallings COA - Section 12.4
	27-Sep	Test 1 (Weeks 1-4)	
6	2-Oct	RISC Principles	Patterson & Frantzen Articles
	4-Oct	MIPS Architecture and Pipeline Performance Demo	
7	9-Oct	Embedded System Architectures	See D2L for On-line resource
	11-Oct	Embedded Systems continued and Polled I/O	Hyde AoA - Section 7.4
8	16-Oct	Fall Break (no class)	
	18-Oct	Real-Time Operating Systems	Peckol, <i>Embedded Systems - A Contemporary Design Tool</i>
9	23-Oct	Case study: ARM Power-up Sequence	See D2L for On-line resource
	25-Oct	Interrupts, DMA, and I/O Peripherals	Hyde AoA - Section 7.10
10	30-Oct	Timer demonstration on 32-bit MIPS	E. Jerónimo Article
	1-Nov	Test 2 (Weeks 5-9)	
11	6-Nov	Virtual Memory and Memory Management	Hyde AoA - Sections 6.6-6.7
	8-Nov	Instruction-Level Parallelism (ILP) - MMX and VLIW	MHPCC Parallel Programming Introduction
12	13-Nov	Superscalar Machines and Memory-Level Parallelism (MLP)	Sarmiento Paper
	15-Nov	Thread-Level Parallelism (TLP) - Intro to multiprocessors and SMP	MHPCC Paper
13	20-Nov	Cache Coherence and Clusters	Stallings COA - Sections 7.8.1 - 7.8.2
	22-Nov	Lab Thanksgiving Holiday (no class)	
	27-		

14	Nov	Clusters (continued)	See D2L for On-line resource
	29-Nov	Test 3 (Weeks 10-14)	
15	4-Dec	OpenMP/SMP Lab	Intel SW Network: Getting Started with OpenMP
	6-Dec	Review for final exam	
Exam	11-Dec	Final Exam - 1:20 p.m. - 3:20 p.m.	

Final Exam Times:

The following time has been arranged by the University for the final exam for our section of CSCI 4717. You can verify these times with the University's Final Exam Schedule

- Section 001: Tuesday, December 11, 1:20 p.m. - 3:20 p.m.

[BACK TO TOP /span>](#)

Grading policy:

The table below shows the weights carried by each assignment toward calculating a student's final grade.

Assignment	Portion of final grade
Quizzes/assignments	19 %
Test 1	22 %
Test 2	22 %
Test 3	22 %
Final Exam	15 %
Total	100%

The table below presents the translation between a student's total score and his or her final grade.

Percent cutoff (Minimum score for grade)	Grade
93	A
90	A-
87	B+
83	B
80	B-
77	C+
73	C
70	C-
67	D+
60	D
0 to less than 60	F

Posting of grades:

The following is duplicated from Section 5.9 of the East Tennessee State Faculty Handbook which is available on-line at <http://www.etsu.edu/senate/facultyhandbook/>:

"In order to be in compliance with provisions of the *Family Educational Rights and Privacy Act of 1974* (Buckley Amendment), the posting of student grades at East Tennessee State University is prohibited. Interpretations of the Buckley Amendment have also prohibited the use of any codes such as Social Security numbers and other devices that might make identification of a student

and his/her grade still possible.

12/03/87

As a result, the distribution of grades through e-mail and/or over the phone is also not allowed.

Quizzes and Assignments:

In an effort to improve retention of the course material, regular quizzes and or assignments will be integrated into the coursework throughout the semester. These include, but are not limited to

- quizzes based on the lecture material,
- homework assignments based on lecture material (problem sheets will be available on D2L),
- short projects typically involving simulation or evaluation of lecture material,
- laboratory exercises, or
- short (less than 10 minute) presentations done in class.

The student should expect between five and ten of these assignments during the course of the semester. ***Unless otherwise specified, all work is to be done on an individual basis.*** The average of the student's scores on these assignments will provide the grade for the "Quizzes/assignments" portion of their grade from the table shown above.

Tests:

There will be three tests throughout the regular semester and a cumulative final exam during exam week. Each test is graded on a 100-point scale and carries a weight toward the calculation of the student's final grade as shown in the table above.

Make-up tests (exams and/or quizzes) will be given for authorized university activities only if a student presents suitable documentation (evidence) explaining the absence to the instructor prior to the scheduled exam time. The instructor reserves the right to disapprove any explanations for absences presented without prior notice and not provide the opportunity for a make-up test. Students knowing they will be absent from an announced test because of personal or business reasons are required to inform the instructor before the absence. A make-up test may be given early in some cases.

Tests may include any material covered in lectures, laboratory exercises, assigned readings, or homework assignments even if the material was not covered directly in lecture.

[BACK TO TOP](#)

Expectations, Attendance, and Participation:

Both students and instructors have expectations of one another. Many of these are mutual. Students should expect the instructor to be in class on time, to be prepared, to be attentive to students, to be available to answer questions and to provide help related to the course, and to make a genuine effort to help students achieve the course objectives. On those rare occasions when the instructor must miss class, students should expect suitable arrangements for the class to continue in the instructor's absence. Students should expect the instructor to devote considerable time and effort to the course.

The instructor has similar expectations of students: that students come to class on time, are prepared, are attentive and participate in class, complete class assignments and submit them on time, and make a genuine effort to meet the course objectives. The instructor expects students to devote considerable time and effort to the course.

When you are absent, you are still responsible for material, assignments, and anything else that occurs in class. When you must miss class, you are responsible for finding out what was missed, making sure that any work due that day gets to the instructor, and getting any assignments or materials handed out during your absence so that you can prepare for the next class. This is a 4-hour course and you should be prepared to spend a minimum of 3-4 hours outside of class for each hour in-class. Attendance and participation is important; students with poor attendance generally do poorly. Missing material from one class makes it difficult to understand new material and, once behind, it is difficult to catch up. You are encouraged to ask appropriate questions and to participate in class discussions and activities. You may learn as much from one another as from the instructor. If you are confused about some point, chances are that others are also confused and will appreciate that you asked for clarification.

In this day and age of Facebook, Google, texting, e-mailing, twittering, etc., it is common to think that everyone is accessible for 24/7 feedback. Please understand that the instructor has other obligations and may not be able to respond immediately to questions submitted by e-mail or voice mail. Be sure to take advantage of other resources to answer your questions if the instructor has not responded to your message in a timely manner. Other resources include the reading material, lecture material, and when issues of academic integrity are not in question, other students. Please do not take this as an attempt to discourage questions, only to let you understand that there will be times when the instructor is not available to answer your questions.

Please observe basic precautions if you become ill. The classroom and lab environments are conducive to the transmission of

[disease. Please be considerate of our class if you are sick.](#)

[BACK TO TOP](#)

Academic Integrity:

[Student-teacher relationships are built on trust. For example, students must trust that teachers have made responsible decisions about the structure and content of the course, and teachers must trust that work submitted by a student was indeed done by the student. Acts which violate this trust undermine the educational process and are inconsistent with our very reason for being at ETSU.](#)

[You are encouraged to discuss the material and issues addressed in the course, including assignments, with members of the class and others. Helping one another find and understand problems in assignments is permitted as long as an honest individual attempt has been made to solve the problem. Everyone, however, must do his/her own work. Completing an assignment "by committee" and submitting it as an individual work is academic misconduct unless the assignment has been clearly designated as a team assignment. Your name on submitted work is an affirmation that the work is yours.](#)

[The following is taken from section 5.7 "Academic Misconduct" of the East Tennessee State University Faculty Handbook, June 1, 2001:](#)

["Academic misconduct will be subject to disciplinary action. Any act of dishonesty in academic work constitutes academic misconduct. This includes plagiarism, the changing or falsifying of any academic documents or materials, cheating, and the giving or receiving of unauthorized aid in tests, examinations, or other assigned school work. Penalties for academic misconduct will vary with the seriousness of the offense and may include, but are not limited to: a grade of 'F' on the work in question, a grade of 'F' of the course, reprimand, probation, suspension, and expulsion. For a second academic offense the penalty is permanent expulsion.](#)

["Plagiarism is defined as follows by Black, Henry Campbell, Black's Law Dictionary, West Publishing Company, St. Paul, Minnesota, 1968 \(p. 1308\): 'The act of appropriating the literary composition of another, or parts or passages of his writings, or the ideas or language of the same, and passing them off as the product of one's own mind.'](#)

["Moreover, 'To be liable for plagiarism it is not necessarily to exactly duplicate another's literary work it being sufficient if unfair use of such work is made by lifting of substantial portion thereof, but even an exact counterpart of another's work does not constitute 'plagiarism' if such counterpart was arrived at independently' \(O'Rourke vs. RKO Radio Pictures, D. C., Mass., 44F. Supp. 480, 482, 483\)."](#)

Special Accommodations:

[Students with needs for note taking or test taking accommodations should make arrangements with the instructor during the first week of the term.](#)

Laptop Policy:

[The use of laptops or PDAs for the purpose of note taking or viewing the on-line course reading is permitted. **All other uses are prohibited.** Any student found to violate this policy will be asked to discontinue use of the device for the remainder of the class period. A second offense will result in the removal of the student's laptop privileges for the remainder of the semester.](#)

Snow/ice:

[Classes are seldom canceled: use your better judgment if main roads are snow-covered or icy. Please listen to the radio \(WETS\) or visit the \[University's Alert Page\]\(#\) if there is any doubt about early morning classes being canceled or delayed.](#)

Use of CSCI Laboratories: The CSCI laboratories are to be used only for work pertaining to CSCI courses. You may not work in the Nicks Hall or Gilbreath Hall labs for other freshman and sophomore level computer science classes. Failure to abide by this policy may result in the removal of your lab privileges which likely will result in a failing grade. A complete list of lab rules to be observed when using a CSCI laboratory can be found at <http://www-cs.etsu.edu/departments/rules.htm>.

Food, drinks, and tobacco products: Food, drinks, and the use of tobacco products of any type are never permitted in any of the labs. In addition, no tobacco products of any type may be used inside ETSU campus buildings.