WENTWORTH INSTITUTE OF TECHNOLOGY

College of

Computer Architecture

Fall 2015

**Course Number:** COMP227-0 **Instructor Name:** Joseph Lawrance

**Classroom:** BEATT303, RBSTN201, WENT306, WTSN002 **Office Hours:** Posted at http://joeylawrance.com

**Class Schedule:** 8-9:15am, 8-9:50am; 11-12:15pm, 10-11:50am (TRF)  **Office Location:** Dobbs 133

**Lecture/Lab/Total Credits:** 3/2/4 **Office Telephone Number**: 617-989-4749

**Email address:** lawrancej@wit.edu

**COURSE DESCRIPTION:**

This course covers binary number and codes, logic elements, combinational and sequential logic, and architectural design of a computer using these elements. Prerequisites: COMP201 (Computer Science II).

**REQUIRED TEXTBOOK(S):**

Patterson, David A. and Hennessy, John L. *Computer Organization and Design, 4th Edition*, Morgan Kauffman, 2011.

**THE COLLEGE BOOKSTORE:**

Location: 103 Ward Street Boston MA 02115

Telephone: 617-445-8814

**RECOMMENDED LEARNING MATERIALS:**

<http://www.saylor.org/courses/cs301/><http://www.kolls.net/cml/cml-sep1.pdf>

**COURSE LEARNING OUTCOMES:**

1. Count, perform arithmetic, and convert among binary, hexadecimal and octal integers and reals.
2. Convert among truth tables, function tables, Venn diagrams, K-maps, logic expressions, logic gates, and MUX and ROM configurations.
3. Simplify and manipulate logic expressions using Boolean algebra and De Morgan’s laws.
4. Design combination and sequential logic circuits.
5. Compare and contrast microarchitecture and instruction set architecture.
6. Compare and contrast RISC and CISC.
7. Organize memory into a hierarchy.
8. Distinguish among various forms of input and output organization.
9. Use Flynn’s taxonomy to classify parallel architectures, and predict gains using Amdahl’s law.
10. Develop a CPU.

**INSTRUCTIONAL METHODOLOGIES:**

“Tell me and I'll forget; show me and I may remember; involve me and I'll understand.” – Chinese Proverb  
“Having somebody do it for themselves is worth being told about it a thousand times.” – Bill Nye  
“A candle loses nothing by lighting another candle.” – James Keller“Anything you practice gets easier. The first time you rode a bike you sucked.” – Marshall Brain

Learning requires work. Research indicates that we learn through practice, teaching others, and discussion that corrects misconceptions. Lecture, reading and demonstrations are ineffective. We do not learn until we put what we read, hear or see into practice.



We will use Git with Gitlab for obtaining and submitting assignments, tracking feedback and posting supplementary material.

We will use Logisim to learn about circuit design.

**ATTENDANCE POLICY:**

“Eighty percent of success is showing up.” – Woody Allen

Show up on time. Participate regularly.

* After 3 unexcused absences, you will receive an attendance warning.
* After 6 unexcused absences, you will be withdrawn from the course.
* <http://www.wit.edu/catalog/2012-Catalog/academic-policies/Attendance.html>

Excused: athletics, conferences, weddings, funerals, illnesses, job interviews, jury duty, and transit problems  
Unexcused: hangovers, all-nighters, sleeping through the alarm, video game launches, etc.

**GRADING POLICY:**

“Success consists of going from failure to failure without loss of enthusiasm.” – Winston Churchill

**Points Activity**

20 Midterm 1

20 Midterm 2

60 Assignments/Labs/Project

See the grading rubric for more information.

**WENTWORTH GRADING SYSTEM:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Grade** | **Definition** | **Weight** | **Numerical Definition** |
| A | Student learning and accomplishment far exceeds published objectives for the course/test/assignment and student work is distinguished consistently by is high level of competency and/or innovation. | 4.00 | 96-100 |
| A- | 3.67 | 92-95 |
| B+ | Student learning and accomplishment goes beyond what is expected in the published objectives for the course/test/assignment and student work is frequently characterized by its special depth of understanding, development, and/or innovative experimentation. | 3.33 | 88-91 |
| B | 3.00 | 84-87 |
| B- | Students learning and accomplishment meets all published objectives for the course/test/assignment and the student work demonstrates the expected level of understanding, and application of concepts introduced. | 2.67 | 80-83 |
| C+ | 2.33 | 76-79 |
| C | 2.00 | 72-75 |
| C- | Student learning and accomplishment based on the published objectives for the course/test/assignment were met with minimum passing achievement. | 1.67 | 68-71 |
| D+ | 1.33 | 64-67 |
| D | 1.00 | 60-63 |
| F | Student learning and accomplishment based on the published objectives for the course/test/assignment were not sufficiently addressed nor met. | 0.00 | Less than 60 |

**ADD/DROP:**

Students should check the academic calendar to confirm the add/drop deadline. Dropping and/or adding courses is done online. Courses dropped in this period are removed from the student’s record.

Non-attendance does not constitute dropping a course. If a student has registered for a course and subsequently withdraws or receives a failing grade in its prerequisite, **then the student must drop that course**. In some cases, the student will be dropped from that course by the Registrar. However, it is the student’s responsibility to make sure that he or she meets the course prerequisites and to drop a course if the student has not successfully completed the prerequisite. The student must see his or her academic advisor or academic department chair for schedule revision and to discuss the impact of the failed or withdrawn course on the student’s degree status.

**MAKE-UP POLICY:**

Please talk to me if you are absent or plan to be. Work receives a 20% penalty for each week late.

**ACADEMIC SUPPORT:**

The Learning Center assists all Wentworth students with academic challenges in the areas of math, science, technical courses specific to majors, and writing. The Learning Center is a supportive and safe learning environment for students looking to improve or maintain their academic standing. In this student-based learning environment, students can receive individual help with their studies, meet and work in study groups, or find resources to assist them in meeting their goals for academic success.  It includes tutors in many subjects, writing assistance and workshops.  Make appointments at [www.wit.edu/tlc](http://www.wit.edu/tlc)

**ACADEMIC HONESTY STATEMENT:**

Students at Wentworth are expected to be honest and forthright in their academic endeavors. Academic dishonesty includes cheating, inventing false information or citations, plagiarism, tampering with computers, destroying other people’s studio property, or academic misconduct” (Academic Catalog). See your catalogue for a full explanation.

**STUDENT ACCOUNTABILITY STATEMENT:**

If you plan to cheat yourself of an education by copying or misrepresenting the work of others as your own, why not drop out now and buy a fake diploma instead? It’s a much better deal than learning nothing while paying for a college degree. You learn by doing the work.

You may discuss work with others, but cite any collaboration. Academic dishonesty will result in a grade of zero for violators and accomplices and will not be dropped. The second violation will result in an “F” for the course for violators and accomplices. Other potential penalties include: removal from the course, institute suspension or expulsion.

**DISABILITY SERVICES STATEMENT:**

Any student who thinks s/he may require a disability related accommodation for this course should contact Disability Services to discuss your specific needs. Disability Services coordinates reasonable accommodations for students with documented disabilities. They are located in Watson Hall 003 (the Counseling Center) and can be contacted at 617-989-4390 or [counseling@wit.edu](mailto:counseling@wit.edu). For more information on acceptable documentation and the Disability Services process, visit the Disability Services website at [www.wit.edu/disabilityservices](http://www.wit.edu/disabilityservices).

**COLLEGE OF THE FENWAY STUDENTS:**

If you are enrolled in this course through COF Cross Registration, notify your course instructor. Please provide her/him with your email address to be sure that you receive course information in a timely way. You should also discuss how to access online applications that might be used in the course. Please note that cross registered students who wish to drop or withdraw from this course must complete the necessary paperwork according to the Wentworth calendar.

**SYLLABUS OUTLINE:**

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| --- | --- | --- | --- |
| **Week** | **Topic** | **Reading** | **Assignments/Notes** |
| **1** | **Introduction to Computer Systems** | **Chapter 1** |  |
| **2** | **Information representation** | **Chapter 2** | **Assignment 1 Due** |
| **3** | **Combinational logic** | **Chapter 2** | **Assignment 2 Due** |
| **4** | **Combinational logic** |  | **Assignment 3 Due** |
| **5** | **Sequential logic** |  | **Exam 1** |
| **6** | **Sequential logic** |  | **Assignment 4 Due** |
| **7** | **Machine code** | **Chapter 3** | **Assignment 5 Due** |
| **8** | **Processor architecture** | **Chapter 4** | **Assignment 6 Due** |
| **9** | **Processor architecture** | **Chapter 4** | **Assignment 7 Due** |
| **10** | **Performance optimizations** | **Chapter 5** | **Assignment 8 Due** |
| **11** | **Memory hierarchy** | **Chapter 6** | **Exam 2** |
| **12** | **Process, memory management** | **Chapter 8,9** | **Assignment 9 Due** |
| **13** | **Input/Output** | **Chapter 10** | **Assignment 10 Due** |
| **14** | **Project presentations** |  | **Project Presentations** |
| **15** | **Project** |  | **Project Due** |