

CMSC 201
Computer Organization
Fall 2019

<http://marmorstein.org/~robert/Fall2019/cs201.html>

Lecture (Stevens 118): 1:00pm-1:50pm(MWF)

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Office Hours: 2:00pm-4:00pm MWF, 3:00pm-4:00pm R *or by appointment*

To make an appointment to see me, please contact me by e-mail and send me your schedule. Include as much detail as you can about why you need to see me (this saves time). In general, I need at least 24 hours of notice to schedule an appointment.

Course Description: The organization, design, and structure of computer systems, including both hardware and software principles. Topics include memory addressing, machine-level representations of software and data, fundamentals of logic design, and the mechanics of information transfer and control within a computer system. 3 credits.

Prerequisite:

CMSC 160; CMSC 162 recommended.

Student Learning Outcomes: By the end of the course, the successful student will be able to:

- describe the representation of data values in binary and hexadecimal
- analyze software at the assembly code level
- build complex computational systems from simple circuits
- explain ways in which system design affects software design, security, and performance

Course Structure and Student Expectations:

This is a lecture-driven course with significant lab and reading components. In addition to regular attendance at lecture, you should expect to spend at least six hours a week outside of class reading the textbook, completing projects, reviewing for exams, and working on homework exercises.

Tests: The only exam in this course will be the final exam. It will be a comprehensive exam covering all substantive topics of the course.

Projects: There will be at least four projects in this course. Please see the tentative schedule below for due dates. Several of the projects in this course (particularly the “data” lab, the “bomb” lab, and the “attack” lab) are extraordinarily difficult and take a long time to complete. You should expect to spend an extra 8-12 hours in the lab during weeks when these projects are due (and less time in subsequent weeks).

Quizzes and Homework Problems: In addition to weekly or bi-weekly homework assignments, I will give unannounced (pop) quizzes over topics from the reading assignments.

Textbook:

The textbook for this course is “Computer Systems: A programmer's perspective,” by Randal E. Bryant and David R. O'Hallaron, Third Edition, Pearson, 2014, ISBN: 978-0134092669

Course Requirements:

Your grade will be determined by your performance on the **final exam (15% of your grade), course projects (40%) and homework problems/quizzes(40%) and participation(5%)**. See the tentative schedule below for due dates.

University Policies:

This course adheres to the university policies found at <http://www.longwood.edu/academicaffairs/syllabus-statements/>.

Grading Policy:

Your final grade in this course is computed using a weighted average of your scores on each assignment. The weights for each category are given in the course requirements section of this syllabus and can be used by applying the following formula:

$$\text{Final Grade} = 0.40 * \text{Projects} + 0.40 * (\text{Homework and Quizzes}) + 0.05 * \text{Participation} + 0.15 * \text{Final}$$

Each of the category grades (such as Projects) can be computed by summing the points you've earned on each assignment in that category and dividing by the total number of points possible. Numeric grades are translated to letter grades using the following grading scale:

	100-91:	A	90:	A-	
89:	B+	88-81:	B	80:	B-
79:	C+	78-71:	C	70:	C-
69:	D+	68-64:	D		
63 or lower:	F	(There is no grade of D- in this course. Anything below a 64 is failing)			

Late Work:

In general, I do not accept late work or grant extensions on assignments unless you have a serious medical or family emergency which prevents you from completing the assignment on time (however, see “Slip days” below). In such cases, you do not need a doctor's note, but you must notify me of the circumstances within a reasonable amount of time.

Since slip days do not apply to homework or quizzes, I may occasionally be persuaded to grant extensions on these assignments. However, in cases where I grant such extensions, I will impose a penalty of 25% per day overdue.

All requests for extensions (whether for an emergency or not), **MUST** be submitted by e-mail within a reasonable amount of time (typically twelve hours from the original due date). This e-mail should outline (in detail) the reasons your work is late. Granting of extensions is entirely at my discretion – if you have not turned an assignment in on time, you should expect to earn a 0%.

Slip Days:

You will be allocated a fixed number of slip days at the start of the semester. You may use your slip days to extend the due date of one or more *programming projects*. You can use all of your slip days on one assignment or you may use them over multiple assignments.

Slip days are calculated from the minute the assignment is due until you turn it in. The number of slip days used is rounded *up* to the nearest integer value. That means that if you turn an assignment in 24 hours and 1 minute after the due date, you will use up *two* slip days. The slip day clock runs over weekends and holidays. If a lab is due on Friday and you turn it in on Monday, you will have used three slip days, not one. Slip days cannot be shared, traded, bought, or sold, but can occasionally be earned by participation in relevant campus activities I select.

Attendance:

I expect you to attend class unless you are sick or engaged in a school-sponsored sport or extracurricular activity. Please do NOT come to class if you are sick. Instead, contact me within 12 hours of the absence to check whether you've missed any work and make arrangements to make up any missed quizzes. You should also make arrangements to get notes from another student in the class. You should also check the course web site for announcements, new assignments, and other important updates.

I will rely primarily on your honor for enforcement of the attendance policy. However, I will keep a record of your attendance. In accordance with Longwood policy, missing more than 10% of scheduled class time (5 class sessions) to unexcused absences may, at my discretion, result in loss of one letter grade and missing 25% of class or more (14 sessions), whether excused or not may result in an automatic failing grade.

Cell Phones and Laptops:

Cell phones, music players, and laptops are to be turned off and put away during class, except as needed for the lab sessions. Violations of this policy will be considered an **unexcused** absence. I will not interrupt class to notify you if you have been counted absent for use of a prohibited device. Feel free to contact me by e-mail at any point in the semester to check on the number of absences you have in my class.

Food and Drink:

You may bring non-alcoholic beverages, including soft drinks, to class. However, please do not eat in class (it distracts me and the other students). Violations of this policy will be considered an **unexcused** absence. I will not interrupt class to notify you if you have been counted absent for violation of this policy. Feel free to contact me by e-mail at any point in the semester to check on the number of absences you have in my class.

I occasionally grant exceptions to this rule for students who must otherwise forgo lunch or have medical needs that require them to eat in class. If you feel that you need such an exception, you must make arrangements with me in advance (i.e. before bringing food to class).

Honor Code and Collaboration:

I firmly believe in the honor code. As such, I encourage you to actively collaborate with other students and to discuss homework problems. However, there is a point at which collaboration becomes

cheating. To help you understand the line between acceptable discussion of a project and dishonorable behavior, I ask you to observe the following rules:

1. Exams and quizzes are to be completed entirely on your own. You may not discuss them with anyone or use any resources except those specifically outlined on the exam handout.

2. You must give proper attribution.

Whenever you receive help or use an online resource, you should comment your code to give proper credit. A simple comment like:

```
/* based on http://codewarrior.com */
```

or

```
/* Jessica helped me with the curly braces here */
```

is fine. This comment should go directly above or on the same line as the code on which you received help, so that it is clear exactly which parts of your program are original and which are not. You do NOT need to cite material you obtain directly from me (in lecture, the assignment handout, or office hours). In general, you also do NOT need to cite material taken from the textbook.

3. The work you submit should, in general, be either your own original work or material which I have provided and you have suitably modified yourself. At no point should another student touch your keyboard while helping you with a project. ***For homework and projects, everything you turn in should be something YOU have personally typed or hand-written. You may NOT copy code electronically from other students or the Internet.***

You MAY NOT share code with other students using flash drives, cell phones, e-mail, web sites, floppies, CDs, or other means unless I specifically direct you to do so. You MAY NOT print out copies of your code to share with other students (personal copies or copies to show me during office hours are fine).

You MAY use web sites, books, and the man pages as reference materials. However, you must cite them appropriately and you MUST re-type any code you find and not just download it or copy/paste it.

4. Do not copy large blocks of code from other students or the Internet.

You MAY assist other students or get assistance with simple problems like syntax errors, but you MAY NOT copy large blocks of code, such as entire classes or functions, from each other. A good guideline of what "large" means is that copying more than three complete programming statements is usually too much.

5. You are responsible for securing your code.

Helping other students to cheat is also cheating. Furthermore, it is your responsibility to make sure that other students do not use your work to cheat. Be careful with who you let access your account and report any missing files, flash drives, or other devices to me promptly.

Infractions of these policies will be dealt with harshly under the Longwood Honor Code. Any student convicted of an honor offense involving this class will automatically receive a final course grade of **F** in addition to any penalties imposed by the Honor Board. You should consider all work in this class to be pledged work, whether or not the pledge appears on the assignment.

If you have questions about the honor code policy, PLEASE ask me. It is much better to receive a late penalty on a single assignment than to fail the course and face honor board charges.

You may find the scenarios at <https://integrity.mit.edu/handbook/writing-code> helpful in understanding this policy. While their honor code policy is not identical to mine it is very, very similar.

Tentative Course Schedule:

Week1 (Aug. 26 – 30)	Principles of Computer Organization, Basic Logic Circuits, Truth Tables and the Laws of Logic Breadboarding Activity Read Chapters 1 and 2 (through Section 2.2)
Sept. 2 Sept. 3	LABOR DAY: NO CLASS Last Day to Drop (by 5pm)
Week 2 (Sept. 4 – 6)	Bits and Bytes, Units of Memory and Computation, Bitwise and Logical Operations, Two's Complement Arithmetic, Arithmetic Overflow, Shifting and Casting Read Section 2.3
Week 3 (Sept. 9 – 13)	Floating Point, Multiplexers and Decoders, Full and Half Adders Read Section 2.4 Read Sections 3.1 – 3.3, Data Lab Due
Week 4 (Sept. 16 – 20)	Introduction to Assembly Language, Registers, Arithmetic, Control Statements Read Sections 3.4 – 3.7
Week 5 (Sept. 23 – 27)	Data Representation: Structs, Arrays, Pointers, Buffer Overflow Read Sections 3.8 through 3.12, Assembly Language Lab Due
Week 6 (Sept. 30 – Oct. 4)	CPU and ALU, the Fetch-Decode-Execute cycle Read Sections 4.1 – 4.3
Week 7 (Oct. 7 – 11)	Pipelining Read Sections 4.4 – 4.6
Oct. 14 – 15	FALL BREAK: NO CLASS
Week 8 (Oct. 16 – 18)	Project Work Week Electronics/Microcontroller Activity

Week 9 (Oct. 21 – 25)	Catchup and Review Read Chapter 5 Bomb Lab Due
Week 10 (Oct. 28 – Nov. 1)	Memory Circuits Read Sections 6.1 – 6.2
Week 11 (Nov. 4 – 8)	The Memory Hierarchy, Caching Read Sections 6.3 – 6.7
Week 12 (Nov. 11 – 15)	Disks, Capacity, Elevator Algorithms, Attack Lab Due
Week 13 (Nov. 18-20)	Catchup and Review
Nov. 22	SYMPOSIUM DAY: NO CLASS
Week 14 (Nov. 25)	Parallelism and Amdahl's Law
Nov. 27 – 29	THANKSGIVING BREAK: NO CLASS
Week 15 (Dec. 2 – 6)	Catchup and Review
Dec. 11	Final Exam (Wednesday, 3:00–5:30pm)

Major Assignments

The largest part of your grade will come from the projects and homework assignments.

Projects: The projects are worth 40% of your grade. Tentative due dates for the projects are given in the course schedule above.

Homework Assignments and Quizzes: I give pop quizzes, which are unscheduled and not announced in advance. Quizzes count as homework assignments. In general, there will be one homework assignment per chapter (see the reading schedule above), but I may occasionally split these up into several smaller assignments when material is particularly difficult.

At the end of the course, we will cover some material that is not in the book. I will provide additional homework assignments to review this material.

Exams: The final exam in this course will be held on Wednesday, December 11th at 3:00pm. It is worth 15% of your grade. There is no midterm exam in this class.