CMSC 201
Computer Organization
Fall 2025
http://marmorstein.org/~robert/Fall2025/cs201.html

Lecture (Stevens 118): 11:00am-11:50am MWF

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Office Hours: 12:00pm – 3:00pm TR or by appointment

To make an appointment, please contact me by Slack or by e-mail with your schedule for the week. Include as much detail as you can about why you need to see me (this saves time). I will reply with some times I am available within the next two days so that we can find a time that works for both of us.

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*

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: 978-0-134-09266-9

Course 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
- evaluate simple logic circuits and create a truth table for them
- explain ways in which system design affects software design, security, and performance
- identify the advantages and disadvantages of different kinds of memory caching systems

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

- build complex computational systems from simple circuits
- analyze software at the assembly code level
- describe the properties of an Internet of Things device

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, closed-book, closed-notes 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 and the "bomb" 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 roughly weekly homework assignments, I will give unannounced (pop) quizzes over topics from the reading assignments.

Course Requirements: Your grade will be determined by your performance on the final exam (15% of your grade), course projects (40%), 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/.

Disability Accommodations Policy: If have a disability and require accommodations for this course, I am happy to work with you, but you must (prior to receiving accommodations) do two things:

1. Register with with the Accessibility Resources Office in Brock Hall

2. Schedule a meeting with me early in the semester to discuss a plan for your accommodations.

Should you need temporary accommodations due to an injury or illness, you should reach out to both me and ARO and we can discuss how to meet your needs while you work with ARO to address your long-term needs.

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:

*Final Grade = 0.40 * Projects + 0.40 * (Homework and Quizzes) + 0.05 * Participation + 0.15 * Exam*

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. Any grade below 64% is a failing grade.

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 believe very strongly 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 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. The best way to do this is to place a comment above or on the same line as the code on which you received help or used a resource. For example:

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

or

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

is fine. 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.

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 online and not just download it or copy/paste it.

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, Slack, Discord, CDs, floppy disks, 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**).

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 anyone else. This includes both other students and external sources, such as web sites. How much code is “too much” depends partly on context, but a good guideline of what "large" means is that copying more than three complete programming statements is usually too much.

There are web sites that purport to have solutions or "walkthroughs" for some of the projects in this course. **You MAY NOT use these sites in any way.** (This includes not only code repositories, but also online videos and web forums).

5. You may not use Generative AI on your assignments.

Generative AI technologies (including large language models, such as ChatGPT, Google Bard/Duo/Gemini, Meta's Llama, and Github Co-pilot) use sources without proper attribution. As such, use of these tools implicitly commits plagiarism, an honor code violation. You MAY NOT use these tools in any way on work you submit for this course.

You MAY use these tools to generate examples for your own learning and study as long as none of the code or other content you generate is used (even accidentally) on any submitted work.

6. 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. If you are stuck on an assignment, I am happy to help you in a way that encourages learning and retention.

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 similar.

Tentative Course Schedule:

Week1 (Aug. 25 – 29)	Principles of Computer Organization, Basic Logic Circuits, Truth Tables and the Laws of Logic **First Breadboarding Activity** **Read Chapters 1 and 2 (through Section 2.2)**
Sept. 1	*LABOR DAY: NO CLASS*
Week 2 (Sept. 3 – 5)	Bits and Bytes, Units of Memory and Computation, Bitwise and Logical Operations, Two's Complement Arithmetic, Arithmetic Overflow, Shifting and Casting **Second Breadboarding Activity** **Read Section 2.3**
Week 3 (Sept. 8 – 12)	Floating Point Representation, Multiplexers and Decoders, Full and Half Adders **Read Section 2.4** **Read Sections 3.1 – 3.3,**
Week 4 (Sept. 15 – 19)	Introduction to Assembly Language, Registers, Arithmetic, Control Statements **Read Sections 3.4 – 3.7, Data Lab Due**
Week 5 (Sept. 22 – 26)	Data Representation: Structs, Arrays, Pointers, Buffer Overflow **Read Sections 3.8 through 3.12, Assembly Language Lab Due**
Week 6 (Sept. 29 – Oct. 3)	CPU and ALU, the Fetch-Decode-Execute cycle **Read Sections 4.1 – 4.3**
Week 7 (Oct. 6 – 8)	Project Work Week **Third Breadboarding Activity**
Oct. 9 – 10	**FALL BREAK: NO CLASS**
Week 8 (Oct. 13 – 17)	Pipelining **Read Sections 4.4 – 4.6** **Bomb Lab Due**
Week 9 (Oct. 20 – 24)	Benchmarking and Software Performance **Read Chapter 5**

Week 10 (Oct. 27 – Oct. 31)	Memory Circuits Read Sections 6.1 – 6.2
Week 11 (Nov. 3 – 7)	The Memory Hierarchy, Caching Read Sections 6.3 – 6.7
Week 12 (Nov. 10 – 14)	Disks, Capacity, Elevator Algorithms, Attack Lab Due
Week 13 (Nov. 17 – 21)	Parallelism and Amdahl's Law
Nov. 19	RESEARCH DAY: NO CLASS
Week 14 (Nov. 24)	Embedded Systems and the Internet of Things
Nov. 26 – 28	THANKSGIVING BREAK: NO CLASS
Week 15 (Dec. 1 – 5)	Catchup and Review Internet of Things (IoT) Activity
Dec. 9	Final Exam (Tuesday, 3:00–5:30pm)