

**CMSC 208**  
**Theory of Grammars, Languages, and Automata**  
**Spring 2020**

<http://marmorstein.org/~robert/Spring2020/cs208.html>

**Lecture (Stevens 118):** 2:00pm-3:15pm (TR)

**Instructor:** Robert Marmorstein (marmorsteinrm@longwood.edu)

**Phone:** (434)395-2185

**Office Hours:** 2:00-4:00pm MWF, 1:00-2:00pm T or by appointment

**Office:** Ruffner 329

*I am also available by appointment. My schedule is posted near my office door. To make an appointment, please check the schedule to see which times I am free, then contact me by e-mail and list some possible times we could meet. In general, I need at least 24 hours of notice to schedule an appointment.*

**Communications Policy**

The best ways to get in touch with me outside of office hours are either to use Slack or to send e-mail to [marmorsteinrm@longwood.edu](mailto:marmorsteinrm@longwood.edu). Typically, I will reply within 24 hours (often sooner) on weekdays. I often reply much quicker – even on weekends.

If you are asking for help with a project or homework problem by e-mail, you should attach your code or your work to the e-mail or copy/paste the part you are working on into the body of the e-mail. **Do NOT attach screenshots or pictures taken on your phone.** They are hard to read and take up too much space in my inbox. In general, e-mails containing images will be deleted unread.

An even better way to get in touch with me is to use **Slack**. Slack is a chat utility with clients for mobile devices and desktop computers. It will allow you to easily send me code snippets. Also, since I get notifications when a slack message comes in, I am more likely to reply to your message quickly if you use Slack than if you send me e-mail.

Slack is also a good way to communicate with other members of the class. Feel free to ask for help on the course Slack – as long as you stick to general questions about topics and do not share large blocks of code.

**Course Description:** This introduces topics in theoretical computer science including formal languages, grammars, and computability, which form the basis for analysis of programs and computation. These tools are then used to explore several modern programming languages and survey the major programming paradigms. 3 credits.

**Prerequisites:**

*CMSC 160 and MATH 175; CMSC 162 is recommended.*

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

- Use induction and other techniques to construct valid mathematical proofs
- Analyze the complexity of algorithms using asymptotic analysis
- Describe languages using regular expressions, context-free grammars, and automata
- Explain the differences between the major programming language paradigms

**Textbook:**

The textbook for this course is "Introduction to Automata Theory, Languages, and Computation", 3rd Edition, by John Hopcroft, Rajeev Motwani, and Jeffrey D. Ullman, ISBN: 978-0321455369

**Course Requirements:**

In addition to the final exam, there will be two midterms. The **final exam** will count for 25% of your grade. Each of the **midterm exams** will count for 15% of your grade. The remaining 45% of your grade will come from the **homework assignments** for each week and unannounced pop **quizzes**. Some of the homework assignments may involve programming projects.

**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:

$$\text{Final Grade} = 0.25 * \text{Final} + 0.15 * \text{First Midterm} + 0.15 * \text{Second Midterm} + 0.45 * \text{Homework and Quizzes}$$

Each of the category grades (such as the homework) 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)			

**Course Structure and Student Expectations:**

This is a lecture-driven course with a significant homework and reading component.

In addition to regular attendance at lecture, you should expect to spend three to six hours a week outside of class reading the textbook, completing homework assignments, and reviewing for exams.

**Tests:** This class will have three exams: two midterm exams and a comprehensive final exam. The final exam will cover all substantive topics of the course, including those tested on both midterms. Tentative dates for the exams are given on the schedule below.

**Quizzes and Homework Problems:** In addition to weekly homework assignments, I will give unannounced (pop) quizzes. The quizzes will be drawn largely from the reading, so it is important to read each week's chapter by the beginning of that week. Typically, you will have one or two weeks to work on these homework assignments. Some of the homework assignments may require programming.

**University Policies:**

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

**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. In exceptional circumstances, I may be persuaded to grant extensions on one or more projects or assignments. 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 (typically within twelve hours of the deadline).

All requests for extensions **MUST** be submitted by e-mail within a reasonable amount of time. 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 zero.

**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.

If you fail to turn in an assignment due to attendance, I will not allow you to make it up unless the absence is excused and you have contacted me separately about the assignment. If you miss class, be sure to check with me **by email** about any quizzes or homework assignments you may have missed.

**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.

**Lab Computers:**

Although this class is scheduled in the Stevens lab, we will not be using the lab systems. When you come to class, you should turn your monitor so that I can see your face. If you are using the lab systems when you should be paying attention in lecture, I will give you an unexcused absence for the day.

**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. 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 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, 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).

#### 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 a web site or from another student. 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.

#### 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 similar.

#### Tentative Course Schedule:

Jan. 14 – 16	Review of Discrete Mathematics: Sets, Functions, and Relations <b>Read “Sets, Relations, and Functions” Handout</b>
Jan. 21 – 23	Sequences and Series, Recursion and Recurrence Relations, Functional Programming <b>Read “Sequences and Series” Handout</b>
Jan. 28 – 30	Algorithms and Asymptotic Analysis (Big-O, Big-Omega, Big-Theta) <b>Read “Big-O” Handout</b>
Feb. 4 – 6	Propositional, Predicate, and Boolean Logic, Quantifiers, Logic Programming <b>Read “Laws of Logic” Handout</b>
Feb. 11 – 13	Catchup and Review, <b>Midterm Exam I</b>
Feb. 18 – 20	Proof Techniques <b>Read Sections 1.1 – 1.3</b>
Feb. 25 – 27	Proof by Induction <b>Read Sections 1.4 – 1.5</b>
Mar. 2 – 6	<b>SPRING BREAK: NO CLASS</b>

Mar. 10 – 12	Finite Automata: DFAs and NFAs (Chapter 2)
Mar. 17 – 19	Regular Expressions and Languages <b>Read Chapters 3 and 4</b>
Mar. 24 – 26	Grammars and Pushdown Automata <b>Read Chapters 5 and 6</b>
Mar. 31 – Apr. 2 <sup>nd</sup>	Catchup and Review, <b>Midterm Exam II</b>
<b>Mar. 31</b>	<b>Deadline to withdraw without an 'F'</b>
Apr. 7 – 9	The Pumping Lemma <b>Read Chapter 7</b>
Apr. 14 – 16	Turing Machines <b>Read Chapter 8</b>
Apr. 21 – 23	Computability and Decidability <b>Read Chapter 9</b> <b>Final Review Packet Due: Apr. 23</b>
Apr. 28	Catchup and Review
May 1 (Friday)	Final Exam (3:00-5:30pm)

## Major Assignments

The largest parts of your grade will come from the exams and the homework assignments.

**Exams:** The final exam for this course is worth 25% of your grade. There will be two midterm exams each worth 15% of your grade. See the schedule above for exam dates.

**Homework Assignments:** In general, there will be one homework assignment per chapter (see the reading schedule above), but I will add additional homework assignments to cover material not described in the book and we may combine some chapters into a single assignment. In general, you should expect one homework assignment each week, which will be due on the first day of class the following week. The course web site will list the due dates of all assignments.

In addition to homework assignments covering the reading, some of the assignments may involve programming projects.

**Quizzes:** I give pop quizzes, which are unscheduled and not announced in advance.

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.