



CSCI 340: COMPUTATIONAL MODELS

DEPARTMENT OF COMPUTER SCIENCE
MILLERSVILLE UNIVERSITY OF PENNSYLVANIA
SPRING 2021

INSTRUCTOR

William Killian
Assistant Professor
Roddy 133

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OFFICE HOURS

-T-R- 03:00PM - 04:00PM
--W-- 08:00AM - 11:00AM
Zoom: 972-1028-2828

SECTION 50

-T-R- 08:00AM - 09:50AM
Zoom: 927-7731-8387

SECTION 50A

-T-R- 10:00AM - 11:50AM
Zoom: 978-5159-3622

ZOOM INFORMATION

Office Hours Password
my last name, all lowercase

All Lecture Passwords
computational models

PREREQUISITES

C- or better in CSCI 162
AND
C- or better in CSCI 140

COURSE TEXTBOOK (OPTIONAL)

Intro. to Computer Theory 2e
Daniel Cohen
ISBN: 978-0471137726

COURSE DESCRIPTION

Introduction to theory of computation. Topics include finite state automata, regular languages and grammars, pushdown automata, context-free languages and grammars, Turing machines, limits on algorithmic computation. Offered in spring.

COURSE OUTCOMES

1. Understanding of various proof techniques. In particular, proofs by mathematical induction as well as proof by (machine) construction.
2. Demonstrate the ability to carry out proofs by induction for simple problems.
3. Define, interpret, and construct deterministic finite-state automata and non-deterministic finite-state automata.
4. Define, interpret, and construct regular expressions.
5. Apply regular expressions and finite state automata formalisms to practical programming problems.
6. Define, interpret, and construct context free grammars
7. Define, interpret, and construct deterministic pushdown automata and non-deterministic pushdown automata
8. Apply context free grammars and pushdown automata formalisms to practical programming problems.
9. Understand parsing techniques and study their application to theory of compiler design.
10. Understand the concept of Turing machines and their applications to computability.
11. Explain the concepts of computable function, the universal machine, the decision problem, and the difference between decidable and undecidable problems.

GRADING

60% Exams 20% Labs 20% Homeworks 2% **BONUS**

GRADING SCALE

< 60	< 63	< 67	< 70	< 73	< 77	< 80	< 83	< 87	< 90	< 93	< MAX
F	D-	D	D+	C-	C	C+	B-	B	B+	A-	A

NOTES

- A minimum exam average of **70%** is required to earn at least a **70%** in the class
- Lack of virtual participation/attendance will result in a grade penalty
- **BONUS** is at the discretion of the professor

COURSE COMPONENTS

Due to the unique situation introduced this term because of the COVID-19 pandemic, I will combine various methods of instruction. We will meet **synchronously** during our scheduled class time. There will be some days where out-of-classroom work will be to watch/view lecture videos while other out-of-classroom work will be traditional laboratory assignments or homework assignments.

VIDEO RECORDINGS

The bulk of the material for the course will be presented through video lectures, however, there will likely be some video recordings as well. These video recordings will vary in length – ranging between 5 minutes and 30 minutes. I will do my best to have them only cover a single topic. Video Recordings may be assigned prior to a synchronous lecture period. You will be expected to have watched all assigned videos *prior* to the start of the next class.

I will post the video recordings through MU Video (which is accessible through [D2L](#)).

SYNCHRONOUS MEETINGS / LECTURES

We would normally be in a physical classroom during our scheduled times listed on the schedule. Instead, I will offer synchronous Zoom meetings. Most of these meetings will be lecture centric. But we will often split into breakout rooms to solve various problems. Active engagement during these synchronous meetings is expected and mandatory.

STUDENT OUTCOME EVALUATION METRICS

EXAMS

Large-stakes written evaluations designed to take about 90 minutes during our scheduled class period. The first three exams are not cumulative in terms of topics; however, certain topics have implicit “prerequisites” where prior material covered in the class will be expected to be retained. Exams measure all student outcomes.

I will leverage Examity for proctoring the exams. While taking any online examination the following will be expected of you:

- You must be using a computer running Microsoft Windows or Apple macOS
- You must have your webcam turned on and be visible
- You must have your microphone turned on
- You must not be hardware muted or have your microphone turned down
- You must not access any webpage on your computer other than D2L
- You must not reference any notes or course material, be they digital or physical
- You must not communicate, coordinate, or collaborate with anyone
- You must not access any other software on your computer besides a web browser. For some exam problems I may permit you to use a program called JFLAP

HOMEWORK ASSIGNMENTS

Low-stakes individual or pair assessments that will last throughout the entire semester. Homework problems will be assigned at the end of almost every single class. They are graded on both process and correctness (rather than attempt). Computational Models is more like a mathematics course than a full “computer science” course. Homework assignments measure all student outcomes.

LABORATORY ASSIGNMENTS

Medium-stakes individual assessments that will cover a variety of topics throughout the semester (and effectively measure outcomes 3 through 8 and 10). There are five laboratory assignments spaced throughout the semester which are roughly equivalent in weight.

EXPECTATIONS

A course syllabus serves as a contract between you and me.

MY EXPECTATIONS OF YOU

- Arrive prepared and on time for class
- Engage in active discussion during lecture
- Ask questions. Do not hesitate to clarify a concept
- Do your best work and be confident in your abilities
- Check email frequently for announcements and additional information
- Treat everyone with respect
- Adhere to Millersville University’s Student Code of Conduct
- Adhere to Millersville University’s Academic Honesty Guidelines

Attendance of our synchronous lecture periods is **mandatory**. I encourage everyone to make an active attempt toward participating. Please refrain from using your computer for any other reason than learning during our class period. I will ask you to leave my class if I observe misuse of technology. *Unexcused absences from synchronous lecture periods WILL result in a 1% grade reduction per occurrence.*

YOUR EXPECTATIONS OF ME

- All graded assignments will have a turnaround time of one calendar week.
- You will have one calendar week to contest any published grades in the grade book.
- Any email or digital communication will be responded to within 24 *weekday* hours.
- **No late submissions** are acceptable for homework assignments. Period.
- **Five** grace days will be applied to laboratory assignments. At most **three** may be used on a single assignment. Once all days are used a grade of **zero** will be applied to the assignment.
- I will be respectful, approachable, and receptive to feedback.

COURSE RESOURCES

ZOOM

<https://millersville.zoom.us>

We will use Zoom for all of our synchronous meetings throughout the semester. Zoom information can be found on the first page of the syllabus. You will want to download the Zoom client rather than just use the website. You will want to “Log in with SSO” and enter [millersville](#) as the organization when logging into Zoom for the first time. The Information Technology Wiki is a great resource to learn more about how to use Zoom. <https://wiki.millersville.edu/display/instructdocs/Zoom>

JFLAP

<http://www.jflap.org/jflaptmp/july27-18/JFLAP7.1.jar>

JFLAP is a special (free!) program that will allow us to model and simulate various machines that accept different classes of languages. JFLAP requires that you have the Java Runtime Environment installed on your computer. You can download and install JFLAP from it’s official website (listed above)

EMAIL

william.killian@millersville.edu

For any private communication you wish to have with me, you are always welcome to contact me via email. This can be a question, comment, or concern – or for any other reason.

WEBSITE

cs.millersville.edu/~wkillian

My CS webpage has resources and material for the class posted on it (including this very syllabus). Handouts, material, videos, and other resources will be accessible through my webpage.

BRIGHTSPACE D2L

<https://millersville.desire2learn.com>

D2L is the University’s official LMS (Learning Management System). It will be used for announcements, the gradebook, discussions, examinations, and homework submissions.

AUTOLAB

<https://autolab.millersville.edu>

Autolab is our website for autograded laboratory submissions. If you have never used Autolab before, please let me know so I can go over the basics.

RESOURCE UNAVAILABILITY

If for any reason any of the above resources are not functioning as they should, please let me know immediately. I can help troubleshoot Zoom. I may be able to resolve issues related to my website. And if there is a problem with Autolab I will do my best to resolve it as quickly as possible.

UNIVERSITY POLICIES

STUDENT CODE OF CONDUCT

The Office of Student Conduct and Community Standards exists to educate students about the expectations of the Millersville University community and to assist students in their development. Millersville University wants to ensure that all of our students have an exceptional, productive and challenging educational experience in a civil and safe environment. Millersville University strives to balancing individual and community rights, while promoting a safe, student centered, and inclusive community. <https://www.millersville.edu/studentconduct/files/studentcodeofconduct.pdf>

ACADEMIC DISHONESTY POLICY

- *Things you may do:*
 - Discuss approaches to solving a problem, as long as the discussion remains *above the level of detail* expected for the course.
 - Email me or visit me during office hours.
 - Go to tutoring to ask about theoretical concepts
- *Things you may not do:*
 - Visit any website with purchasable solutions
 - Post to or visit websites with resources to problems
 - Obtain any solution on open/closed source repositories
 - Obtain a solution from someone who has previously taken the class
 - Coordinating, collaborating, or communicating during any online evaluation

Copying or observable collaborating on individual assignments is not permitted and may result in failure of the course and expulsion from the University. *Writing code is no different than writing a paper — if it was not your original idea, then you should not submit it as your own work.* This applies to all evaluated assessments. <https://www.millersville.edu/honesty-policy>

TITLE IX

Millersville University and its faculty are committed to assuring a safe and productive educational environment for all students. In order to comply with the requirements of Title IX of the Education Amendments of 1972 and the University's commitment to offering supportive measures in accordance with the new regulations issued under Title IX, the University requires faculty members to report to the University's Title IX Coordinator incidents of sexual violence shared by students. The only exceptions to the faculty member's reporting obligation are when incidents of sexual violence are communicated by a student during a classroom discussion, in a writing assignment for a class, or as part of a University-approved research project. **Faculty members are obligated to report to the person designated in the University Protection of Minors policy sexual violence or any other abuse of a student who was, or is, a child (a person under 18 years of age) when the abuse allegedly occurred.**

Information regarding the reporting of sexual violence and the resources that are available to victims of sexual violence is set forth at: <https://www.millersville.edu/titleix>

COURSE SCHEDULE BY WEEK

NOTE: Subject to Change

Week 01, 01/18 - 01/22: Background, Languages, [HW 1](#)

Week 02, 01/25 - 01/29: Recursive Definitions, Regular Expressions, [HW 2](#), [LAB 1](#)

Week 03, 02/01 - 02/05: Finite Automata, Transition Graphs, [HW 3](#)

Week 04, 02/08 - 02/12: Exam Review, [EXAM 1](#)

Week 05, 02/15 - 02/19: Kleene's Theorem, Finite Automata with Output, [HW 4](#), [LAB 2](#)

Week 06, 02/22 - 02/26: Regular and Non-Regular Languages, Decidability, [HW 5](#)

Week 07, 03/01 - 03/05: Context-Free Grammars, Grammatical Format, [HW 6](#)

Week 08, 03/08 - 03/12: Exam Review, [EXAM 2](#), [LAB 3](#)

Week 09, 03/15 - 03/19: Pushdown Automata, PDA = CFG, [HW 7](#)

Week 10, 03/22 - 03/26: Non-Context-Free Languages, Context-Free Languages, [HW 8](#), [LAB 4](#)

Week 11, 03/29 - 04/02: Decidability, [SPRING RECESS](#), [HW 9](#)

Week 12, 04/05 - 04/09: Exam Review, [EXAM 3](#)

Week 13, 04/12 - 04/16: Turing Machines, Post Machines, [HW 10](#), [LAB 11](#)

Week 14, 04/19 - 04/23: Minsky's Theorem, Variations of Turing Machines, Turing Machine Languages, [HW 11](#)

Week 15, 04/26 - 04/30: The Chomsky Hierarchy, Computers, Exam Review, [HW 12](#)

Week 16, 05/03 - 05/07: [FINAL EXAM](#)

Our final exam period is dependent upon your section

- CSCI 340.50's final is **Tuesday May 4th** from 2:45PM – 4:45PM
- CSCI 340.50A's final is **Wednesday May 5th** from 2:45PM – 4:45PM

COUNSELING RESOURCES

Students sometimes face mental health or drug/alcohol challenges in their academic careers that interfere with their academic performance and goals. Millersville University is a caring community and resources are available to assist students who are dealing with problems. The Counseling Center (717) 871-7821 is an important resource for both mental health and substance abuse issues. Additional resources include: Health Services (717) 871-5250 , Center for Health Education & Promotion (717) 871-4141 , Campus Ministries, and Learning Services (717) 871-5554 .

MY TEACHING PHILOSOPHY

First and foremost, as an educator, my primary role is to support students' well-being. This includes but is not limited to: physical, mental, and emotional health. I am here to help develop students into outstanding individuals. From the academic side, I will teach key concepts related to the computer science curriculum. From the advisement side, I will support students to achieve personal success.

TEACHING METHODS

I will challenge students to do the absolute best work they are able to do, even if they may not have the confidence in their own abilities. I am a proponent of providing captivating lectures through consistent interaction with students and building up lectures as miniature case studies. This methodology molds well to the computer science curriculum since problem solving is a core component of the foundations of computer science.

PRACTICAL SKILLS

In addition to the required course materials covered, I will also cover other practical industry skills. Knowing the theory of computer science is important, but knowing how to leverage that knowledge in industry, academia, or a business setting is also just as crucial. Through the incorporation of real-life application to my lectures, it is my goal that students feel more empowered and ready for any post-graduate position they may pursue.

SELF DETERMINISM

I believe that everyone is capable of achieving greatness. Some concepts will be harder to grasp than others, but I will do my best to engage your mind. I also believe in self mastery. Self mastery does not mean that you will be an expert at everything you do. Instead, self mastery focuses on understanding yourself, specifically your thought process, learning process, and how you react to external events. You should know your strengths and your weaknesses — embrace your strengths and improve upon your weaknesses. Everyone learns in different ways. Even if you may not enjoy the material covered in my lectures, I will do my best to help expand and explore your self-awareness.

WORK-LIFE BALANCE

I know the majority of students are commuting and work part time jobs. When I was a student (here, at Millersville), I also fit into this category. I understand that you wear many hats in your day-to-day life, but I also expect that you will be able to establish a good school-work-life balance. This can be a bit tricky in the beginnings of your college career, but I believe in you! If you want any examples of what to do (and not to do) I can speak from my own experiences.