# CSCI 340: Computational Models

## William K. Killian

## Spring 2019

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| **E-mail:** william.killian@millersville.edu | **Lecture** |
| **Web:** cs.millersville.edu/~wkillian | *Section 01*: TR 10:00AM–11:50AM |
| | *Section 02*: TR 1:10PM– 3:00PM |
| **Office Hours:** | |
| T: 9:00AM – 10:00AM | **Classroom:** Roddy 256 |
| W: 9:00AM – 10:00AM, 12:00PM – 2:00PM | **Lab:** Caputo 131 (Mac Lab) |
| R: 9:00AM – 10:00AM | **Office:** Roddy 141 |

## 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.

*Prerequisite(s):* Grade of C- or better in both CSCI 140 and CSCI 162

## Course Outcomes

1. Understating of various proof techniques. In particular, proofs by mathematical induction. Be able to demonstrate the ability to carry out proofs by induction for simple problems.

2. Define, interpret, and construct deterministic finite-state automata and non-deterministic finite-state automata; define, interpret, and construct regular expressions; apply these formalisms to practical programming problems.

3. Define, interpret, and construct context free grammar; define, interpret, and construct deterministic pushdown automata and non-deterministic pushdown automata; apply these formalisms to practical programming problems.

4. Understand parsing techniques and study their application to theory of compiler design.

5. Understand the concept of Turing machines and their applications to computability.

6. Explain the concepts of computable function, the universal machine, the decision problem, and the difference between decidable and undecidable problems.

# Textbook

*Note:* The textbook is optional but highly recommended

- Daniel Cohen *Introduction to Computer Theory 2e* ISBN: 978-0471137726

# Course Policies

### Responses

I will respond to emails within 24 hours unless an exception is noted through email, D2L, or in class. Please note that this means if you email me the night before an exam or assignment submission, I am not guaranteed to respond. Start labs when they are assigned.

### Announcements

I will frequently post announcements and new/additional material on D2L and *optionally* the course website. Read over it by the date indicated on the announcement. Under inclement weather, due dates may be pushed back or changed at my discretion, so please pay attention to all announcements.

### D2L (Desire2Learn)

Link to D2L I will primarily use D2L as the grade portal for classes. The submission portion will also be leveraged for homework assignments. Lecture material and notes are accessible through the course website (found on my homepage).

### Office Hours

I hold office hours for your benefit. Please do not hesitate to show up to office hours! If you find that my office hours do not fit your schedule, let me know so we can arrange for a time that does work.

### My Expectations of Students

- 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

- Adhere to Millersville University's Academic Honesty Guidelines

### Lecture

Attendance of the lecture is mandatory. I encourage everyone to make an active attempt toward participating. There are times where many examples throughout the lecture are better suited to be done with pen and paper. Please refrain from using your computer for any other reason than note-taking for the class. I also do not expect to see any mobile phones in use during class. I will ask you to leave my class if I observe misuse of technology. **CSCI 340 is essentially a mathematics course – a laptop should not be used**.

### Laboratory

Attendance of any laboratory component is also mandatory. Assignments will be given and will most likely take more time to complete than the lab period. You are permitted to leave the lab period if and only if you have completed the assignment.

### Grading Policy

- **45%** of your grade will be determined by three tests throughout the semester (15% each)

- **15%** of your grade will be determined by homework assignments (the lowest grade will be dropped)

- **25%** of your grade will be determined by laboratory assignments (5 total @ 5% each)

- **15%** of your grade will be determined by a final examination – mostly consisting of new material

- Up to **2%** will be added to your grade *at the professor's discretion* based on active participation during lecture and laboratory periods.

I will grade on a ten-point grading scale. I will **NOT** round any grades. An 89.51 will be classified as a B+

| $\geq 93$ | $\geq 90$ | $\geq 87$ | $\geq 83$ | $\geq 80$ | $\geq 77$ | $\geq 73$ | $\geq 70$ | $\geq 67$ | $\geq 63$ | $\geq 60$ | $< 60$ |
|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|--------|
| A | A- | B+ | B | B- | C+ | C | C- | D+ | D | D- | F |

YOU **MUST ATTEMPT** ALL EXAMS, HOMEWORKS, AND ASSIGNMENTS TO PASS THE COURSE.

### Labs

Labs will have a grading turnaround time of one (1) week from the due date. Lab grades can only be contested for up to one week from when the grade is posted on Desire2Learn. Three grace days will be provided throughout the semester without penalty. Otherwise, no late submissions will be permitted.

### Homeworks

Homework assignments will be submitted digitally through D2L or autolab (depending on which is more appropriate). **No late submissions will be permitted with homework assignments**. All homeworks will have a grading turnaround time of one (1) week from the due date. Homework grades may only be contested for up to one week from when the grade is posted on Desire2Learn.

### Exams

Exams will be graded by the next class (e.g. Tuesday-Thursday class with a test on Thursday will have the tests returned the immediately following Tuesday. Monday-Wednesday-Friday class with a test on Friday will have the tests returned the immediately following Monday). **You do not get to keep your exams.** Failure to return an exam will result in an updated grade of zero (0). I will hand them out in class and go over any answers, but I will collect them during the class period.

# University Policies

## Academic Dishonesty Policy

Copying or extensive collaboration on assignments is not permitted and may result in failure of the course and expulsion from the University. You may discuss approaches to solving a problem, as long as the discussion remains above the level of detail expected for the course. You may also seek aid in resolving compiler messages. However, if you copy a code fragment verbatim, you are likely committing academic dishonesty. If you copy a code fragment and rename variables, you are likely committing academic dishonesty. *Obtaining a solution on the Internet or elsewhere and submitting it as your own work is plagiarism and will result in severe disciplinary measures.* Be sure you can explain every line of every program you submit. **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.**

## Title IX

Millersville University and its faculty are committed to assuring a safe and productive educational environment for all students. In order to meet this commitment, comply with Title IX of the Education Amendments of 1972, 20 U.S.C. §1681, et seq., and act in accordance with guidance from the Office for Civil Rights, 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 incidents of 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 available at http://www.millersville.edu/sexualviolence/index.php

## 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 (871-5250), Center for Health Education & Promotion (871- 4141), Campus Ministries, and Learning Services (717-871-5554).

# Planned Course Schedule[1]

**Week 01, 01/21 - 01/25:**  Background §1, Languages §2, Recursive Definitions §3

**Week 02, 01/28 - 02/01:**  Regular Expressions §4, Finite Automata §5, **Lab Time**

**Week 03, 02/04 - 02/08:**  Finite Automata §5, Transition Graphs §6

**Week 04, 02/11 - 02/15:**  **Test 1**, Kleene's Theorem §7

**Week 05, 02/18 - 02/22:**  Finite Automata with Output §8, **Lab Time**

**Week 06, 02/25 - 03/01:**  Regular Languages §9, Nonregular Languages §10, Decidability §11

**Week 07, 03/04 - 03/08:**  Context-Free Grammars §12

**Week 08, 03/11 - 03/15:**  **Spring Break**

**Week 09, 03/18 - 03/22:**  **Test 2**, Grammatical Format §13

**Week 10, 03/25 - 03/29:**  Pushdown Automata §14, §15, **Lab Time**

**Week 11, 04/01 - 04/05:**  Non-Context-Free Languages §16, Context-Free Languages §17

**Week 12, 04/08 - 04/12:**  Decidability §18, Turing Machines §19, **Lab Time**

**Week 13, 04/15 - 04/19:**  **Test 3**, Post Machines §20

**Week 14, 04/22 - 04/26:**  Minsky's Theorem §21, Variations of a Turing Machine §22, **Lab Time**

**Week 15, 04/29 - 05/03:**  Turing Machine Languages §23, Chomsky Hierarchy §24, Computers §25

**Week 16, 05/06 - 05/10:**  **Final Exam**

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[1]Subject to change

# 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 — in no way was I an ideal student.