CS 4124: Theory of Computation
Syllabus
Fall, 2016

1 General Course Information

CRN	82477
Meeting Time	12:30 PM–1:45 PM; Tuesday/Thursday
Classroom	Whittemore 277
Midterm Exam	In class, October 13, 2016
Final Exam	10:05 AM–12:05 PM, December 13, 2016

Instructor: Lenwood S. Heath

- **Office:** 2160J Torgersen Hall
- **Office Hours:** 8:00AM–9:15AM Tuesday/Thursday
- **Email:** `heath@vt.edu`

Teaching Assistant: Zhen Guo

- **Office Hours Held in:** TBA
- **Office Hours:** TBA
- **Email:** `zguo@vt.edu`

Web Site: `http://courses.cs.vt.edu/~cs4124/fall2016/index.php`

Piazza Signup: `http://piazza.com/vt/fall2016/cs4124`

Canvas: `https://canvas.vt.edu/`

Prerequisites: MATH 3134 or MATH 3034

Required Textbook: Introduction to the Theory of Computation (Third Edition). Michael Sipser. Thomson Course Technology, 2013. ISBN: 978-1-133-18779-0.

Books On Reserve: For current list, see class Web site.

2 Course Description

This course emphasizes *theoretical models of computation* and their analysis. The aim of analysis is to identify and prove the capabilities and limitations of particular models of computation. It is shown that there are problems that are *unsolvable,* that is, there are questions that cannot be answered by any model of computation. Limits on computation in the context of resource bounds are also investigated. Techniques (reductions) are developed to show that one model of computation is equivalent in power to another or that it is different in power from another. Models of computation that are covered include finite automata, pushdown automata, and Turing machines. Some complexity theory is covered as well.

3 Grading Policy

Grading for the course is on a 1000-point scale, with the points distributed as follows:

Homework assignments: 10 at 60 points each	600
Pop quizzes: 25 at 2 points each	50
Midterm exam: October 13, 2016	150
Final exam: December 13, 2016	200

A typical homework assignment consists of two or three problems, posted on the course Web site approximately one week before the due date. During the first week of class, students will be organized into **discussion groups** of two (or perhaps three) students each. These discussion groups are meant to help students learn the subject by providing **partners** to discuss material with. Also, with his or her partner(s), each student may discuss the homework problems and devise solution strategies. However, each student must write up his or her solutions individually. It is acceptable for a student to proofread and offer feedback on a partner's solutions before they are submitted.

All homework must be prepared with LaTeX[1] or other word processing system and submitted as a PDF to Canvas by 4:00 EST on the due date[2]. Use of LaTeX is **strongly** recommended, though not absolutely required. **No late homework will be accepted.**

There will be one or more pop quizzes during many class periods. The quizzes will test your comprehension of the current reading assignment or the current or previous lecture. Each quiz grade will consist of one point for turning it in and one point for getting the correct answer.

[1] See LaTeX resources on the course Web site.

[2] See due dates on the Calendar on the course Web site.

4 Grading Scale

Grade	Points
A	930–1000
A-	900–929
B+	870–899
B	830–869
B-	800–829
C+	770–799
C	730–769
C-	700–729
D+	670–699
D	630–669
D-	600–629
F	0–599

5 Readings

For most classes, there is a reading assignment (see Section 8) to be completed by class time. Each assignment consists of sections in the textbook.

6 Ethics

The Honor Code applies. All work submitted must be the student's own work. A student may solicit help with homework assignments only from the instructor, the GTA, and his or her partner(s). A student must complete the midterm and final exams without any outside help of any kind.

7 Announcement

If any student needs special accommodations because of a disability, please contact the instructor during the first week of classes.

8 Course Schedule

Dates	Reading Assignment	Topics
August		
8/22–8/26	Chapter 0	Introduction and review
8/29–9/2	Section 1.1	Deterministic finite automata
September		
9/5–9/9	Sections 1.2–1.3	Nondeterministic finite automata; regular expressions
9/12–9/16	Sections 1.4, 2.1	Pumping lemma; context-free grammars
9/19–9/23	Sections 2.2, 3.1	Pushdown automata; Turing machines
9/26–9/30	Sections 3.2–3.3	Turing machines and algorithms
October		
10/3–10/7	Section 4.1	Decidable languages
10/10-10/14	Section 4.2	The halting problem
10/13	**Midterm**	**In class:** Topics through Chapter 3
10/17–10/21	Section 5.1	Reduction
10/24–10/28	Section 5.2	Post correspondence problem
November		
10/31–11/4	Section 5.3	Mapping reducibility
11/7–11/11	Sections 7.1–7.2	Time complexity; complexity class P
11/14–11/18	Sections 7.3–7.4	Complexity class NP; NP-completeness
11/21–11/25	Thanksgiving Break	
11/28–12/2	Sections 7.4–7.5	Proofs of NP-completeness
December		
12/6	**Last Day of Class**	Review for final
12/13	**Final**	**10:05 AM–12:05 PM:** Comprehensive exam

End of Syllabus