

Syllabus: CS 4114
Formal Languages and Automata Theory
Spring, 2014

1 General Course Information

CRN	12247
MEETING TIME	12:30 PM–1:45 PM; Tuesdays and Thursdays
CLASSROOM	Whittemore 349
FINAL EXAM	Saturday, May 10, 1:05–3:05

Instructor: Lenwood S. Heath

- **Office:** 2160J Torgersen Hall
- **Office Hours:** 9:30–11:30 Tuesdays and Thursdays
- **Email:** heath@vt.edu

Teaching Assistant: Elaheh Raisi

- **Office Hours Held in:** McBryde 110
- **Office Hours:** TBA
- **Email:** elaheh@vt.edu

Web Site: <http://courses.cs.vt.edu/cs4114/spring2014/index.php>

Scholar (Course Grades Only): <https://scholar.vt.edu/portal>

Piazza: <http://www.piazza.com/>

Prerequisites:

- MATH 3134, Applied Combinatorics and Graph Theory, or MATH 3034, Introduction to Proofs

Required Textbook: Languages and Machines (Third Edition). Thomas A. Sudkamp. Pearson Education, Inc., 2006. ISBN: 0-321-32221-5.

2 Course Description

This course presents formal models for the computation of functions and for the recognition and generation of languages. The central goal is to define the four language classes in the Chomsky hierarchy in terms of grammars that generate each class and in terms of automata that recognize each class. Contents of the course are largely mathematical, including mathematical proofs and especially proofs by induction.

3 Grading Policy

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

Homework assignments: 10 at about 60 points each	600
Midterm exam: March 20, 2014	150
Final exam: Saturday, May 10, 1:05–3:05	250

A typical homework assignment consists of 2 to 4 problems, posted on the course web site approximately one week before the due date.

All homework must be prepared with L^AT_EX¹ or other word processing system and submitted as a PDF on Scholar, on the due date². **No late homework will be accepted.**

4 Readings

For most classes, there is a reading assignment (see Section 7) to be completed by class time. Each assignment consists of chapters in the textbook.

5 Ethics

The Honor Code applies. All work submitted must be the student's own work. Students may solicit help only from the instructor or the GTA.

6 Announcement

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

¹See L^AT_EX resources on the course web site.

²See Calendar on the course web site.

7 Course Schedule

DATES	READING ASSIGNMENT	TOPICS
JANUARY		
1/20–1/24	Chapter 1	Math review — sets, recursive definitions, proof by induction
1/27–1/31	Chapter 2	Languages; regular sets
2/3–2/7	Chapter 3	Context-free grammars; language generation
FEBRUARY		
2/10–2/14	Chapter 3	Context-free grammars; examples; regular grammars
2/17–2/21	Chapter 4	Normal forms; Chomsky normal form
2/24–2/28	Chapter 5	Deterministic and nondeterministic finite automata
3/3–3/7	Chapter 5	Regular languages
MARCH		
3/10–3/14	SPRING BREAK	
3/17–3/21	Chapter 6	Regular languages; Pumping Lemma; state minimization
3/20	Midterm Exam	Topics through finite automata
3/24–3/28	Chapter 7	Pushdown automata; Pumping Lemma; closure properties
3/31–4/4	Chapter 8	Turing machines; accepting languages
APRIL		
4/7–4/11	Chapter 8	Turing machines; variations; nondeterministic
4/14–4/18	Chapter 10	Chomsky hierarchy
4/21–4/25	Chapter 18	Parsing — top-down, bottom-up
4/28–5/2	Chapter 19	Deterministic parsing — $LL(k)$ grammars
MAY		
5/6	Last Day of Class	Review for final; questions on homework solutions and course material
5/10	Final Exam	1:05–3:05: Comprehensive final exam

END OF SYLLABUS