{ COMP 121 Foundations of Computing Theory }

T-R *Lecture (DC 1315)* – 11:00-12:20

Who:	Michael Gousie
Where:	Discovery Center 1325
When:	Mon 1:30-3:00; Wed/Thu 2:30-4:00
	and by appointment
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Content:

As the field of computer science matures, more and more sophisticated analysis techniques are being brought to bear on practical problems. To understand the computational techniques of the future, today's students will need a strong background in discrete structures.

– Computing Curricula

A course in discrete mathematics is part of the core of computer science. Such a course covers discrete mathematics concepts such as symbolic notation, problem solving, algorithm analysis, and various proof techniques. In this course, we will cover many of the same topics, but in the context of computer science. Indeed, you will see the same topics again, in more detail, in later courses. So what *is* this course? It is a course in mathematical thinking, using symbolic logic to solve or find better solutions to problems. There is no computer programming in this course; rather, there is a lot of *thinking*, and using mathematical tools and techniques. Understanding these will make you a better programmer and computer scientist, ready to tackle whatever iDevice that will come along in the future.

Comp 121 counts towards a computer science major or minor. Those who enjoy this course and would like to go on to being a computer science major and possibly plan to go to graduate school should plan to enroll later in Math 211 for deeper coverage of these and additional topics.

Required Text:

None.

Reference Texts:

Selections are taken from the following sources:

- *Discrete Mathematics for Computer Scientists* by Stein, Drysdale, and Bogart. Addison Wesley, 2011.
- *Discrete Mathematics and Its Applications*, 7^{th} Edition, by Kenneth H. Rosen. McGraw-Hill, 2012.
- *An Introduction to Formal Languages and Automata*, 5^{th} Edition, by Peter Linz. Jones & Bartlett, 2012.
- *Introduction to the Design and Analysis of Algorithms*, 3^{rd} Edition, by Anany Levitin. Pearson, 2012.
- *Discrete Mathematics*, 4^{th} Edition, by Dossey, Otto, Spence, and Vanden Eynden. Addison Wesley, 2002.

Requirements:

There will be two exams during the semester and a final exam. The exams are worth 50% in total. Five or six written homework assignments, roughly one week in length, will be assigned but not graded. Working on the problems will be up to you. Answer keys will be provided. There will be short quiz on the due date of each of the problem sets, in total worth 30% of your grade. There will be three small projects, worth 20% in total. These will be turned in electronically. The due dates for these projects will be announced in class.

Grading:

Grades will be assigned according to the following scale:

A = 93-100, A- = 90-92, B+ = 87-89, B = 83-86, B- = 80-82, C+ = 77-79, etc.

Exam Schedule:

Exam	Weight	Date
Exam 1	16%	October 1
Exam 2	16%	November 12
Final	18%	December 15 @ 9:00 AM

Projects:

Program	**Weight**	**Topic** (Subject to change)	**Approx. Due Date**
Proj 1	6%	Circuits using Logisim	Week 6
Proj 2	7%	Graphs using METAL	Week 12
Proj 3	7%	Finite automata using JFLAP	Week 15

Course Policies:

- You are responsible for all material covered in class.
- You are responsible for all reading as assigned/handed out in class.
- You should bring a scientific calculator to class; your phone calculator may or may not have the necessary functionality, or at the very least, may not be very intuitive. Phones/computers will not be permitted during quizzes and exams, so a calculator is necessary in any case.
- If you must miss a quiz or exam for any reason, you must inform me BEFORE the test. Except in the case of emergency, illness, or you've gotten irretrievably lost using the library entrance in the Discovery Center, makeup exams will not be given.
- Assignment due dates are FIRM.
  - Any electronic projects must be submitted electronically before class (10:59:59 AM) on the due date unless otherwise noted. Projects submitted on the following day will receive a 15% penalty. Anything turned in later will receive a 0. Hard copy, if required, must be submitted at the beginning of class or as instructed on the specification sheet.
  - Although deadlines are firm, please contact me **beforehand** if there are extraordinary circumstances. life *can* get complicated.
  - There will not be any individual "extra credit" work. If you did not have time to do a good job on the original assignment, how will you have time to do *additional* work?
- You are expected to adhere to the Honor Code.

  - Although *discussion* of assignments is encouraged, the *implementation* of projects is to be the result of your own work. Any copying of projects or portions of projects will engender penalties.
  - Written homework/papers should absolutely be your own work.
  - Collaboration on exams/quizzes is prohibited.
  - AI can help you clear up confusion regarding a problem. It should not be used to solve the problem for you, unless you do not want to learn anything. Hence, much of this is up to you. Note that you will not have access to a computer or phone for quizzes and exams, so AI will not be able to help you.
  - You will be required to write and sign the pledge on all work turned in: *I have abided by the Wheaton Honor Code in this work.*
  - Any violation of the above guidelines will result in a 0 for that assignment or exam, and/or a failing grade for the course.

- Unless part of the day's activities, **the use of laptops or other computer/tables is strongly discouraged.** It is to your advantage to take notes and draw diagrams using pen and paper, as this has been shown to be more effective in learning than typing. Special arrangements can be made if necessary (come see me).
- The use of cell phones, iPhones, iPods, iPads, iPlops, iFlops, and other personal electronic devices is prohibited during class and exams.
- Please do not leave once class has begun. This is distracting to the class and to the instructor.
- Accommodations for disabilities:

> *Wheaton College is committed to providing equitable access and supportive services for all students to fully access and thrive in the academic, residential and social aspects of student life. Affirmatively, Wheaton provides appropriate accommodations for eligible students with documented disabilities to afford equal access to educational programs and services. Individuals with disabilities and other access concerns requiring accommodations or information on accessibility should reach out to Accessibility Services at the Filene Center:*
> *∼ accessibility@wheatoncollege.edu or (508) 286-3794 ∼*

Course Schedule (Subject to change)

Week	Day	Topic	Reading
Week 1		**Introduction**	
	Sep 1	Introduction	
	Sep 3	Your computer	
Week 2		**Number systems**	Notes
	Sep 8	Bits-n-bytes	
	Sep 10	Bin, Hex, Dec, Oct (uh, what?	
Week 3		**Logic**	Stein et al., Chapter 3
	Sep 15	Logic statements	
	Sep 17	Conditionals, equivalence	
Week 4		**Boolean algebra**	Rosen, Sections 12.1–12.3
	Sep 22	Boolean algebra, DeMorgan's Laws	
	Sep 24	Circuits/gates	
Week 5		**Algorithms**	Rosen, Chapter 3
	Sep 29	Algorithm notation, trace tables	
	Oct 1	Exam 1	
Week 6		**Counting**	
	Oct 6	Summations and more	Stein et al., Chapter 1
	Oct 8	Algorithm analysis	Levitin, Sections 2.1–2.2
Week 7		**Nothing!**	
	Oct 13	*No class - October Break*	
	Oct 15	*No class - MAP Day*	
Week 8		**Recursion**	Notes
	Oct 20	What is recursion$_{\text{recursion}}$?	
	Oct 22	Recursion and analysis	
Week 9		**Introduction to proofs**	
	Oct 27	Proof techniques	Dossey et al., Section A.3
	Oct 29	Induction	Stein et al., Section 4.1
Week 10		**Graphs**	Stein et al., Section 6.1
	Nov 3	Graph notation and structures	
	Nov 5	Graph algorithms: B—DFS, Dijkstra's	
Week 11		**Trees**	Notes
	Nov 10	Basic trees	
	Nov 12	Exam 2	
Week 12		**Trees, cont. and matrices**	Dossey et al., Appendix B
	Nov 17	Tree algorithms, Huffman encoding	
	Nov 19	Matrix arithmetic	
Week 13		**Finite automata**	Linz, TBA
	Nov 24	Basic finite state machines, JFLAP	
	Nov 26	*No class - Thanksgiving Break*	
Week 14		**More finite automata**	
	Dec 1	Regular expressions and more	
	Dec 3	Turing machines and languages	
Week 15		**Set theory**	Notes
	Dec 8	Definitions and properties	
	Dec 10	Review	
	Dec 15	Final exam @ 9:00 AM	