

---

$O$  COMP 215      Algorithms       $\Theta$   


---

MWF      Lecture – 1:00-1:50

---

Who: Michael Gousie  
Where: Science Center 102  
When: Mon/Wed/Fri 2:00-3:00, Tue 2:00-4:00  
and by appointment  
E-mail: mgousie@wheatoncollege.edu  
Web: <http://cs.wheatoncollege.edu/mgousie/comp215.html>

*This course is part of CONX 2015: Genes in Context*

---

**Content:**

An introduction to the mathematical foundations, design, implementation, and computational analysis of fundamental algorithms. This course represents the third and final installment of the introductory programming sequence. You will polish your C++ (and C) skills while learning many of the most-used and important algorithms and techniques used in varied programming tasks. We will also cover algorithm analysis so that you can determine which technique to use in a given situation. This entails both a theoretical understanding of algorithm analysis (“I’ve proved it will run in  $O(n^2)$ .”) as well as practical considerations (“The program took 34 seconds to run.”), both of which you will be able to apply in later courses, and indeed, your entire computing career.

**Required Text:**

*The Design & Analysis of Algorithms* by Anany Levitin. Addison Wesley; 2<sup>nd</sup> edition (2006).

**Recommended Texts:**

Any texts in C++ and C. While the interweb is good for looking up specific things, search results are often out of context and not a good source for learning new techniques or understanding the bigger picture.

*Introduction to Algorithms* by Cormen, Leiserson, Rivest, and Stein. McGraw Hill; 2<sup>nd</sup> edition (2001). Vigorous algorithm analysis never goes out of style.

**Grading:**

There will be two exams during the semester and a final exam. The exams are worth 45%. Five programming projects account for another 40% of the grade (8% each). Written homeworks, some of which may entail short programs, account for the remaining 15%.

Grades will be assigned according to the following scale:

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

**Exam Schedule:**

Exam	Weight	Date
Exam 1	15%	October 9
Exam 2	15%	November 6
Final	15%	Dec 17 @ 9:00 AM

**Course Policies:**

- You are responsible for all material covered in class.
- You are responsible for all reading as assigned/handed out in class.
- 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 lost in the “new” Science Center, makeup exams will not be given.

- Programming projects will be done in C or C++, depending on the topic. You may work on your programming assignments on any platform and any compiler. However, the final turned-in version must work properly using an ANSI standard C/C++ compiler.
- Written homeworks should be neat and done on loose-leaf or plain paper. Do not tear paper out of a notebook. Staple multiple pages together.
- Assignment due dates are FIRM.
  - All programming projects must be submitted electronically by 11:59:59 PM 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 must be submitted at the beginning of class on the next day or as instructed on the specification sheet.
  - Written homeworks/papers must be submitted at the beginning of class on the due date. There is no provision for late homeworks.
- You are expected to adhere to the Honor Code.
  - Although *discussion* of assignments is encouraged, the *implementation* of programs is to be the result of your own work. Any copying of programs or portions of programs that is not fully documented and discussed as such will also engender penalties.
  - Written homework/papers should absolutely be your own work.
  - Collaboration on exams is prohibited.
  - 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.
- The use of cell phones, iPods, and other personal electronic devices is prohibited during class, labs, and exams.

### Course Schedule (Probably optimistic)

Week	Day	Topic	Reading
Week 1		<b>Introduction</b>	Chapter 1
	Sep 2 Sep 4	Introduction Mathematical notation and theorems	handout
Week 2		<b>Analysis of algorithms</b>	Chapter 2
	Sep 7 Sep 9 Sep 11	Basic algorithm analysis $O$ , $\Omega$ , and $\Theta$ notation Formal algorithm analysis	
Week 3		<b>More analysis, some C</b>	Chapter 2, cont.
	Sep 14 Sep 16 Sep 18	More analysis examples Empirical analysis C vs. C++	handout
Week 4		<b>Brute force algorithms</b>	Chapter 3
	Sep 21 Sep 23 Sep 25	Selection/bubble sorts Searching Convex hull	

## Course Schedule, cont.

Week	Day	Topic	Reading
Week 5		<b>Divide-n-conquer</b>	Chapter 4
	Sep 28 Sep 30 Oct 2	Mergesort Quicksort Binary trees	
Week 6		<b>Faster math</b>	Chapter 4, cont.
	Oct 5 Oct 7 Oct 9	Integer & matrix multiplication Convex hull <small>(What??)</small> Exam 1	
Week 7		<b>Special guest!</b>	
	Oct 12 Oct 14 Oct 16	NO CLASS String matching, Boyer-Moore Designer babies <small>(Huh?)</small>	Sections 3.2 & 7.2
Week 8		<b>Decrease-n-conquer</b>	Chapter 5
	Oct 19 Oct 21 Oct 23	Insertion sort, searching Computing median Gaussian elimination	Chapter 6
Week 9		<b>Transform-n-conquer</b>	Chapter 6
	Oct 26 Oct 28 Oct 30	AVL trees B-trees Red-black trees	Section 7.4 handout
Week 10		<b>More transform-n-conquer</b>	Chapter 6, cont.
	Nov 2 Nov 4 Nov 6	Heaps Horner's rule Exam 2	
Week 11		<b>Dynamic programming</b>	Chapter 8
	Nov 9 Nov 11 Nov 13	Hashing Binomial coefficient, Floyd's Knapsack problem	Section 7.3
Week 12		<b>Greedy algorithms</b>	Chapter 9
	Nov 16 Nov 18 Nov 20	Prim's Kruskal's Dijkstra's	
Week 13		<b>Greedy algorithms, cont.</b>	Chapter 9, cont.
	Nov 23 Nov 25 Nov 27	catch up No class - Thanksgiving No class	
Week 14		<b>Randomized algorithms</b>	Notes
	Nov 30 Dec 2 Dec 4	Random numbers Skip lists P, NP, NP-Complete	Section 11.3
Week 15		Limitations of algorithmic power P, NP, NP-Complete, cont.	Chapter 12
	Dec 7 Dec 9 Dec 11	Backtracking Review	
	Dec 17	Final exam @ 9:00 AM	