



AUBURN

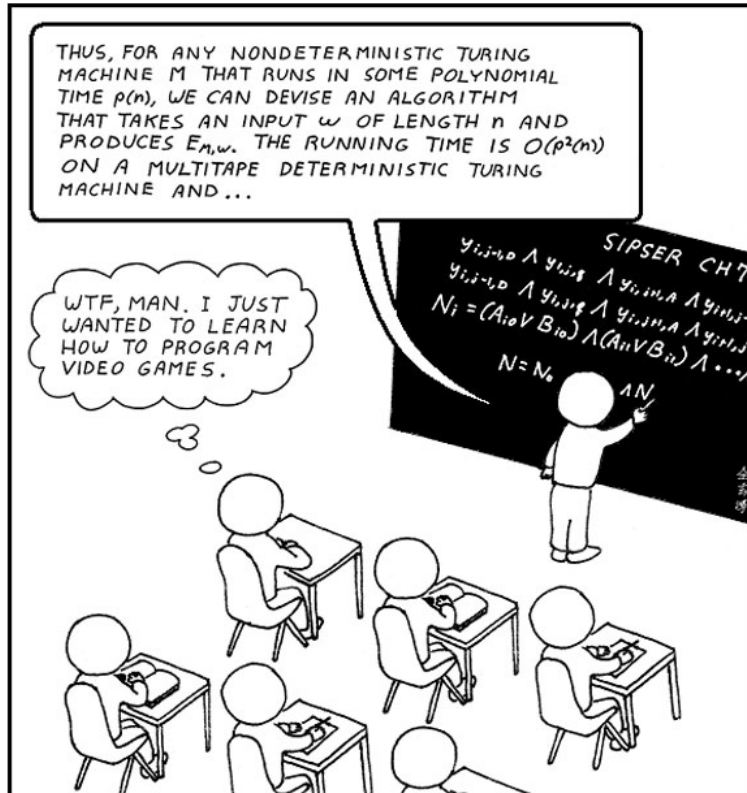
UNIVERSITY

SAMUEL GINN  
COLLEGE OF ENGINEERING

# COMP 2210

Spring 2014 – Dr. Hendrix

## Course content



[http://abstrusegoose.com/strips/computer\\_science\\_major.PNG](http://abstrusegoose.com/strips/computer_science_major.PNG)

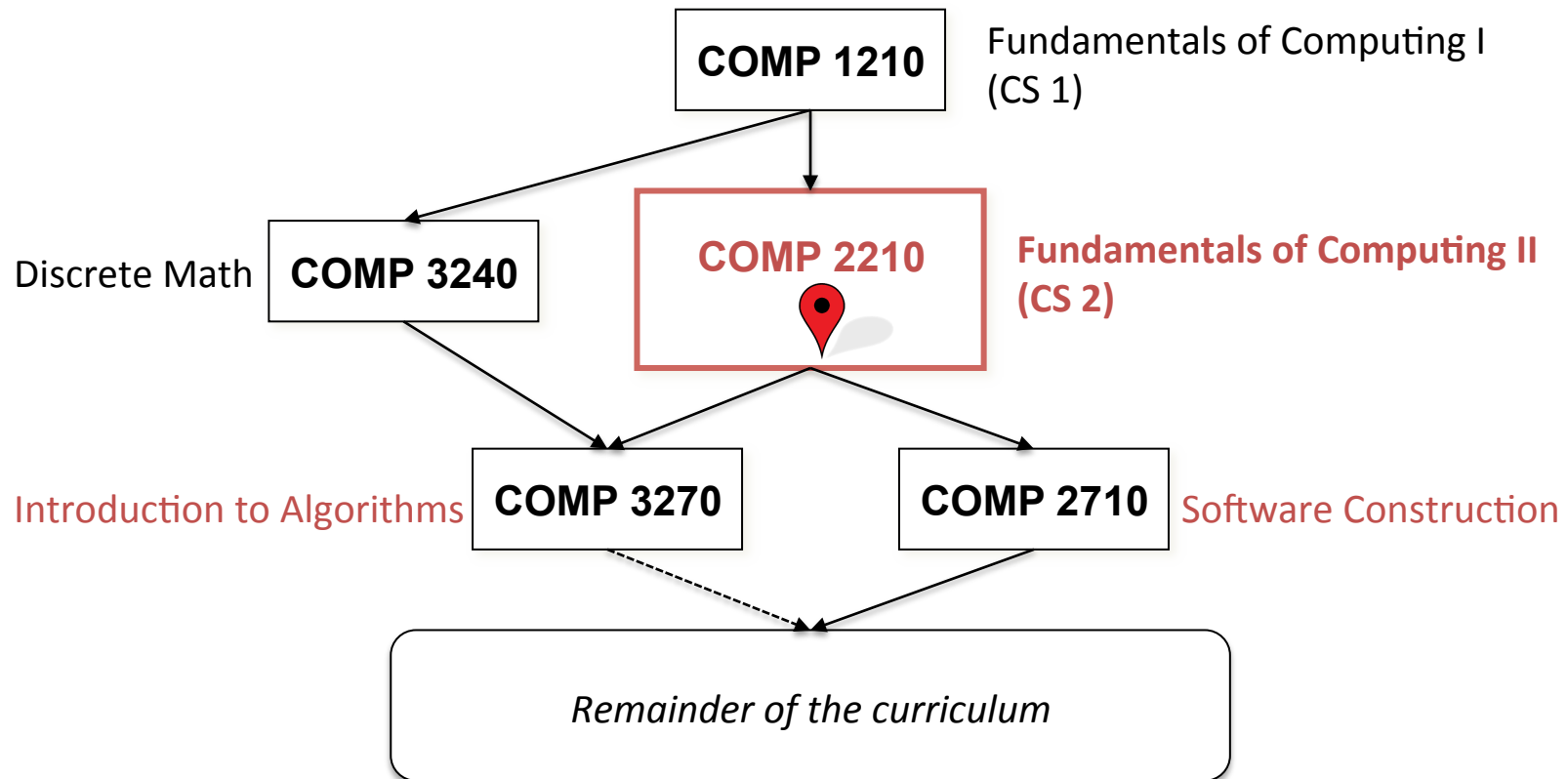


Don Knuth

*"If you find that you're spending almost all your time on theory, start turning some attention to practical things; it will improve your theories. If you find that you're spending almost all your time on practice, start turning some attention to theoretical things; it will improve your practice."*

Excellent advice! You'll have plenty of opportunities to practice this in 2210.

## 2210 in the curriculum



## Course content

COMP 2210 provides core, foundational content that you will build on from this point forward.



Niklaus Wirth

# Data structures + Algorithms = Programs

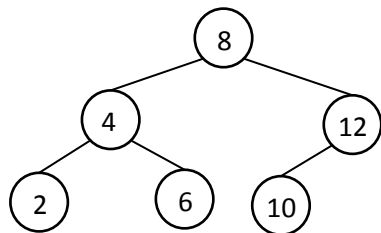
*Methods of storing data*

|    |   |   |    |   |   |
|----|---|---|----|---|---|
| 12 | 2 | 6 | 10 | 8 | 4 |
| 0  | 1 | 2 | 3  | 4 | 5 |

Examine each array element in turn, remembering the smallest seen so far. Return the last value that was remembered.

*Methods of solving problems*

```
public int min(int[] a) {  
    int m = a[0];  
    for (int i = 1; i < a.length; i++) {  
        if (a[i] < m) m = a[i];  
    }  
    return m;  
}
```



Start at the root of the tree and go left as far as possible. Return the value in this node.

```
public int min(TreeNode t) {  
    TreeNode m = t;  
    while (m.left != null) {  
        m = m.left;  
    }  
    return m.value;  
}
```

## Course content



*Bad programmers worry about the code. Good programmers worry about data structures and their relationships.*

**Linus Torvalds**



*Smart data structures and dumb code works a lot better than the other way around.*

**Eric Raymond**



*Show me your flowchart and conceal your tables, and I shall continue to be mystified. Show me your tables, and I won't usually need your flowchart; it'll be obvious.*

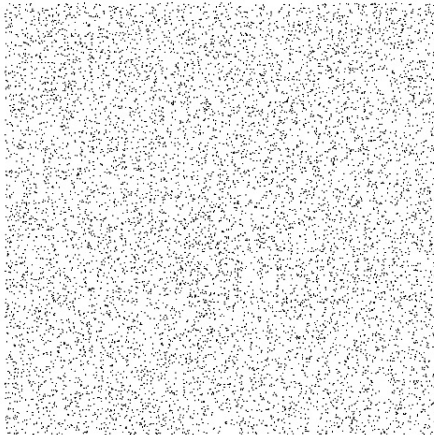
**Fred Brooks**

## Course content

### Example problem: Pattern recognition.

Given a set of two-dimensional points as input, highlight all the points that participate in a specified pattern (e.g., collinear). Assume you have a machine that executes 1 billion instructions per second.

Program input (~100K points)



Program A



~ 3000 years

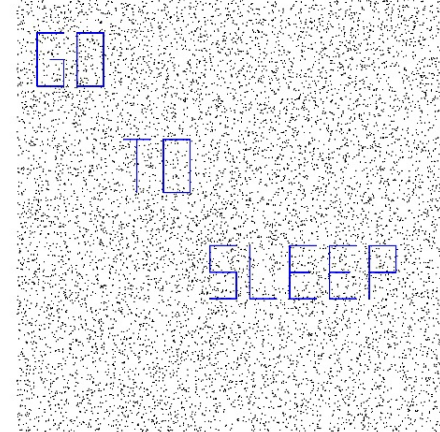


Program B



~ 3 minutes

Program output



**Programs = Data Structures + Algorithms**

## Course text

There is no specific text that is required for the course, but you do need a good CS 2 textbook.

Two good recommendations:

Bailey, Duane A. (2007). *Java Structures – Data Structures in Java for the Principled Programmer* (v7 edition). <http://www.cs.williams.edu/JavaStructures/Book.html> (FREE)

Welcome **Book** Software Documentation Examples FAQ Contact

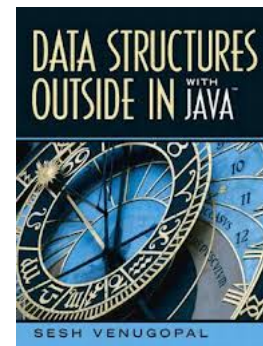
---

### Java Structures, the Book

**Data Structures in Java, for the Principled Programmer**  
You are free to download *Java Structures*, the book, for educational use. You may read the book on-line, or print off copies for use on your campus, at cost.  
[Download Java Structures \(PDF\)](#)

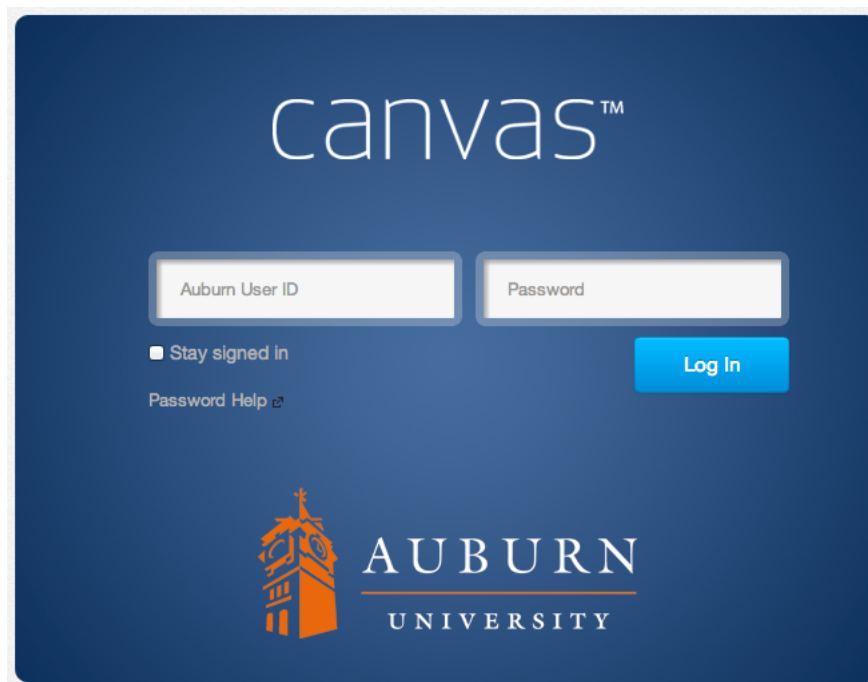
**Support for labs**  
Most chapters of the book conclude with a workable lab on the same subject. Many of these labs are used at Williams. You can download support files [here](#).

Venugopal, S. (2006). *Data Structures Outside-In with Java* (1st ed.). Prentice Hall. ISBN 0-13-198619-8.



## Class materials

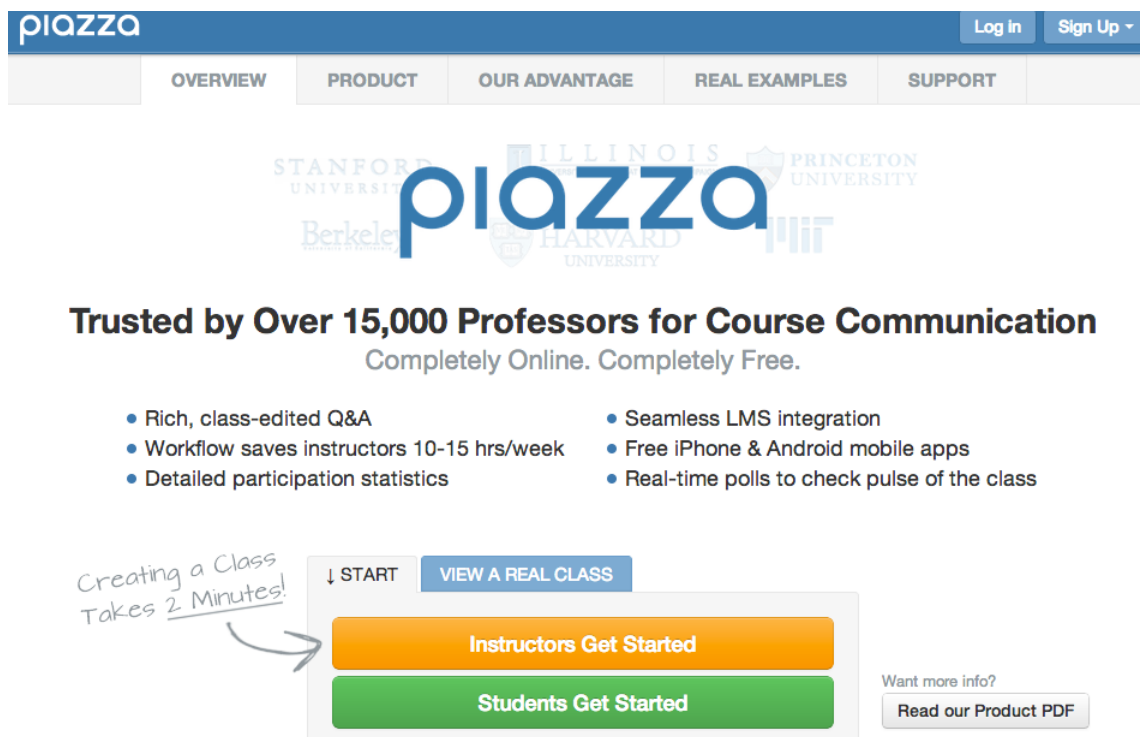
**Course lecture notes and assignments will be available in Canvas.**





## Class discussions/Q&A

Discussions and general questions about course content will occur in Piazza.



The screenshot shows the Piazza website interface. At the top is a blue navigation bar with the Piazza logo on the left, and 'Log In' and 'Sign Up' buttons on the right. Below the navigation bar is a horizontal menu with tabs: OVERVIEW, PRODUCT, OUR ADVANTAGE, REAL EXAMPLES, and SUPPORT. The main content area features the Piazza logo in the center, surrounded by logos of various universities including Stanford, Berkeley, Illinois, Harvard, Princeton, and MIT. Below the logos, the text reads 'Trusted by Over 15,000 Professors for Course Communication' and 'Completely Online. Completely Free.' A list of features is presented in two columns: Rich, class-edited Q&A; Workflow saves instructors 10-15 hrs/week; Detailed participation statistics; Seamless LMS integration; Free iPhone & Android mobile apps; and Real-time polls to check pulse of the class. At the bottom, there is a 'START' button with a downward arrow, a 'VIEW A REAL CLASS' button, and two large buttons: 'Instructors Get Started' (orange) and 'Students Get Started' (green). A handwritten note 'Creating a Class Takes 2 Minutes!' with an arrow points to the 'Instructors Get Started' button. To the right of these buttons is a 'Read our Product PDF' button, preceded by the text 'Want more info?'.

**piazza** Log In Sign Up

OVERVIEW PRODUCT OUR ADVANTAGE REAL EXAMPLES SUPPORT

STANFORD UNIVERSITY ILLINOIS UNIVERSITY PRINCETON UNIVERSITY  
Berkeley HARVARD UNIVERSITY MIT

**piazza**

**Trusted by Over 15,000 Professors for Course Communication**  
Completely Online. Completely Free.

- Rich, class-edited Q&A
- Workflow saves instructors 10-15 hrs/week
- Detailed participation statistics
- Seamless LMS integration
- Free iPhone & Android mobile apps
- Real-time polls to check pulse of the class

Creating a Class Takes 2 Minutes!

↓ START VIEW A REAL CLASS

Instructors Get Started

Students Get Started

Want more info?  
Read our Product PDF

## i>Clicker

All students who wish to receive class participation points are required to have their own **i>clicker** classroom response device. The i>clicker can be ordered online or purchased at area bookstores.



**You must register your i>clicker no later than Tue Jan 14**

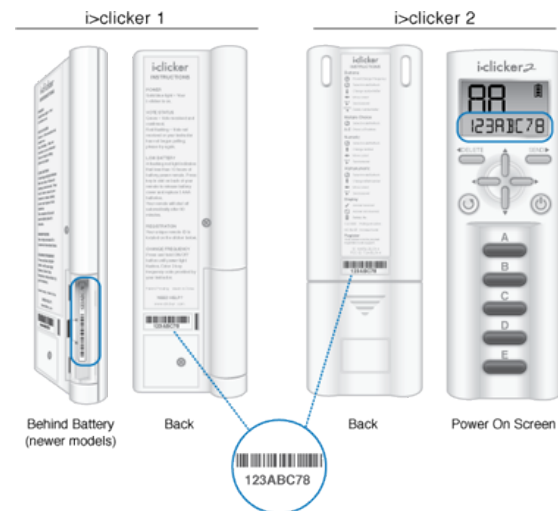
<http://www.iclicker.com/support/registryourclicker/>

**Student ID:** Use your TigerMail ID

**username**@auburn.edu

*Just the first part!*

**Remote ID:** Look on back of device.



## Development environment

**You will need a Java development environment in order to complete the assignments in this course.**

**Required:** Java SE 7 JDK

<http://www.oracle.com/technetwork/java/javase/downloads/index.html>

**Recommended:** jGRASP 2.0.0\_08 beta 4

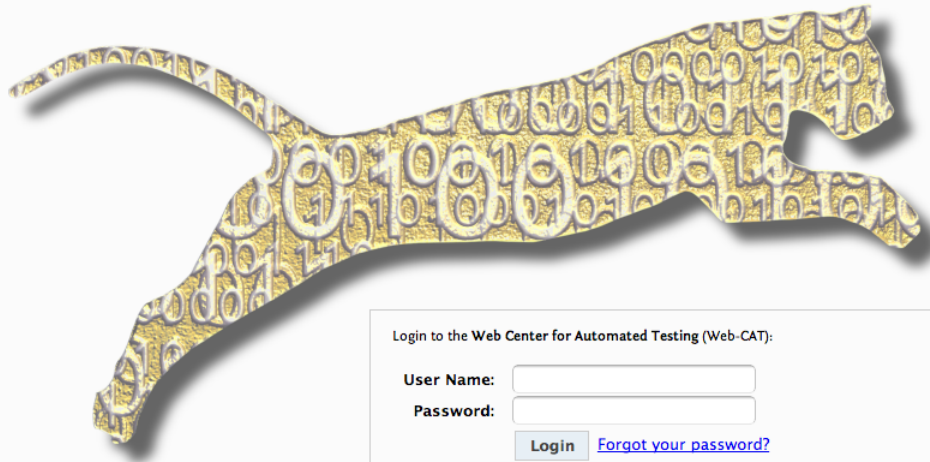
<http://www.jgrasp.org/>

## Assignment grading

Programming assignments will be graded, in part, using Web-CAT.

Web-CAT

*Automatic Grading Using Student-written Tests*



Login to the Web Center for Automated Testing (Web-CAT):

User Name:

Password:

[Forgot your password?](#)

## Engineering account

**You will need an account on the Engineering Network for this course.**

In addition to your AU computer account, you will need an engineering account in order to access the computers in the Shelby 2122 lab. These accounts are generated automatically from course rolls. However, you may need to "sync" your password by going to the OIT My Account page. After you login, click Update Password; enter your password and confirm it (note that you do not need to change your password); be sure "Sync with TigerMail Live Services" is selected and then click Update.

<https://oitappstemp.auburn.edu/myaccount/>

# Course syllabus

## You are responsible for everything in the syllabus.

### COMP 2210 Fundamentals of Computing II Spring 2014

#### Course Staff

**Instructor**  
Dr. Dan Hendrix  
Office: 31270 Shelby Center  
Phone: 334-844-6305  
Email: dh@auburn.edu  
Office Hours: 8:30am-10:00am MWF

**Teaching Assistants**  
Patrick Smith, mps0008@auburn.edu, Shelby 3136  
Jeff Wang, wangchj@auburn.edu, Shelby 2307

#### Course Meetings

**Lecture** Shelby 1103  
11:00am – 11:50am MWF

**Labs** Shelby 2122  
Sec 001 1230-1345 TR  
Sec 002 1400-1515 TR  
Sec 003 1530-1645 TR  
Sec 004 1700-1815 TR  
Sec 005 1830-1945 TR

#### Course Materials

##### Textbook

There is no required text for the course. However, I strongly recommend that you have a good data structures text. Two options are below.

Vengopal, S. (2008). *Data Structures Outside-In with Java* (1st ed.). Prentice Hall. ISBN 0-13-198693-6.  
Bailey, Duane A. (2007). *Java Structures - Data Structures in Java for the Principled Programmer* (V7 edition).  
<http://www.cs.williams.edu/java/structures-book.html> (FREE)

##### Classroom Response Device

All students are required to have their own i-clicker2 classroom response device. The i-clicker2 can be ordered online or purchased at area bookstores. When ordering, be sure to use ISBN1429280476.

##### Java Development Environment

Required: Java SE 7 JDK  
Recommended: jGRASP latest release (2.0.0\_08 beta 4 as of this writing)

##### Engineering Network Account

Each student is required to have an account on the Engineering Network. Consult the online Help Desk (<http://www.eng.auburn.edu/enr/helpdesk/index.html>) or go to 270 Ross Hall for assistance with your account.

#### Course Content

##### Current Bulletin Description

Software development in the context of collections (e.g., lists, trees, graphs, hashables), Communication, teamwork, and a design experience are integral course experiences.

##### Overview

COMP 2210 is designed to introduce fundamental data structures, their associated algorithms, and applications in which they are commonly used. An object-oriented approach to problem solving and program design will be emphasized in the lecture and reinforced in the lab.

Specific course objectives are: (1) Be able to design, implement, and apply data structures based on specifications of abstract data types. (2) Be able to apply concepts and techniques from object-oriented programming. (3) Be able to perform fundamental testing and debugging techniques. (4) Be able to perform fundamental maintenance activities. (5) Be able to perform fundamental time and space analysis on algorithms. (6) Be able to design a set of candidate solutions given a problem statement and recommend the best solution by evaluating tradeoffs and circumstances. (7) Be able to effectively communicate professional work to others in written and oral form. (8) Be able to function effectively on a team to construct software deliverables.

#### Course Outline

| Topic                          | Reading from Bailey |
|--------------------------------|---------------------|
| Searching, Java, OOP           | Appendix B, Ch. 1   |
| Correctness                    | Ch. 2               |
| Generality                     | Ch. 4, 8, 11        |
| Efficiency, Algorithm Analysis | Ch. 5               |
| Sorting                        | Ch. 6               |
| <b>Exam 1</b>                  |                     |
| Collections                    | Ch. 3, 7            |
| Linked Structures              | Ch. 9               |
| Lists                          | Ch. 9, 11           |
| Stacks and Queues              | Ch. 10              |
| Recursion                      | Ch. 5               |
| <b>Exam 2</b>                  |                     |
| Trees                          | Ch. 12              |
| Search Trees                   | Ch. 14              |
| Heaps, Priority Queue          | Ch. 13              |
| <b>Exam 3</b>                  |                     |
| Hashing                        | Ch. 15              |
| Graphs                         | Ch. 16              |
| Disjoint Sets                  | Notes               |
| <b>Final Exam</b>              |                     |
| Monday April 28, 2014          |                     |
| Shelby 1103                    |                     |
| 12:00pm – 2:30pm               |                     |

#### Course Grading

Your grade for the course will be determined by your performance on a sequence of exams and programming assignments, and your participation in the course.

There are a total of four exams planned (three exams during the term and a final at the end of the term, as scheduled by the Registrar). All exams are comprehensive over all the material covered to date, although they focus on the material indicated. No make-up for any exam can be given without an approved University excuse.

There will be a sequence of programming assignments, some of which will be completed individually and others will be completed in teams. No late submissions of assignments can be accepted without an approved University excuse.

During lecture periods, one or more questions will be asked for which you will be expected to respond with the i-clicker2. If you answer all questions asked during a given lecture period, you will be awarded one participation point. The number of participation points that you earn will determine the fraction of two bonus points that will be applied to your course grade.

Your numeric score for the course will be determined according to the following formula where EXAMS is the arithmetic average of your individual exam scores, ASSIGN is the arithmetic average of your individual programming assignment scores, and PART is the fraction of two points corresponding to the percentage of possible participation points that you earned.

$$\text{numeric score} = \text{EXAMS} * 0.70 + \text{ASSIGN} * 0.30 + \text{PART}$$

Your letter grade for the course will be calculated as follows. If EXAMS  $\geq$  60 and ASSIGN  $\geq$  60, then your course letter grade will be assigned per the numeric score above and the standard 10-point scale (90-100 = A, 80-89 = B, etc.). If EXAMS < 60 or ASSIGN < 60, then your course letter grade will be an F.

#### Course Policies

##### Academic Honesty

You will be held responsible for adherence to the Academic Honesty policies described in the *Tiger Cub*. Specifically, each student is expected to apply the Auburn University Oath of Honor to each graded item in this course: *"In accordance with these virtues of Honesty and Truthfulness set forth in the Auburn Creed, I, as a student and fellow member of the Auburn family, do hereby pledge that all work is my own, achieved through personal merit and without any unauthorized aid. In the promotion of integrity, and for the betterment of Auburn, I give honor to this, my oath and obligation."* In certain instances, collaboration on course work is allowed, but these instances will be clearly identified by the instructor and the collaboration is allowed only within the bounds set by the instructor.

##### TigerMail and Electronic Communication

You are responsible for checking your TigerMail email each day. You are required to set your Canvas Notification Preferences to email your TigerMail account right away for new announcements and for conversations to which you are added. Per University policy, email sent to your TigerMail

account is considered official University communication and you are held responsible for it. See the following URL for more details on this policy and more information about student email: [http://www.auburn.edu/oi/account\\_info/igmail/](http://www.auburn.edu/oi/account_info/igmail/).

##### Make-Up Work

Work missed during the semester will be assigned a grade of zero points. Make up work will be given only for valid University excuses with appropriate written verification (see the *Tiger Cub*). It is always your responsibility to initiate arrangements to make up missed work, and these arrangements must be initiated within one week of the original missed due date or within one week of your return to campus (documentation required).

##### Attendance

You are expected to attend all class meetings and stay for the entire period. Your attendance in lecture will directly impact your participation points. You are responsible for all material presented in lecture and in lab whether you are present or not. It is your responsibility to collect any graded materials that were returned during your absence. If you are excessively late to an exam, the instructor reserves the right to count you absent from the exam and give you the opportunity to take a make-up.

##### Special Accommodations

Students who need accommodations are asked to electronically submit their approved accommodations through AU Access and to arrange a meeting during office hours the first week of classes, or as soon as possible if accommodations are needed immediately. If you have a conflict with my office hours, an alternate time can be arranged. To set up this meeting, please contact me by email. If you have not established accommodations through the Office of Accessibility, but need accommodations, make an appointment with the Office of Accessibility, 1228 Haley Center, 844-2096 (V177).

##### Assignment Submission and Grading

Late submissions of any assignment will not be accepted and will result in a grade of zero points. Although partial credit will be given on assignments, source code that does not compile is worth zero points.

##### Graded Material

Graded materials will be returned only in person, so you will have to come by the instructor's office to pick up graded items that were returned during your absence. If you wish to keep graded materials for your records, they must be picked up before the end of the course. Graded materials will be discarded after the final exam period. The final exam will not be returned, but will be kept on file in the instructor's office per University policy.

##### Viewing Grades

Grades will be available for viewing throughout the semester in Canvas. It is your responsibility to make sure that the recorded grades are accurate. CAUTION: Please note that Canvas sometimes displays percentage scores that do not correspond to the numeric score specified in the grading section above. When you view your grades in Canvas, you should only pay attention to the individual item scores and completely ignore the percentage scores that are displayed.

##### Grade Appeals

With the exception of the final exam grade, you have one week from the posting of a grade or the return of a graded item, whichever is first, to dispute the grade. You will have a very short period of time to dispute the final exam grade before official letter grades are recorded with the University.

Appeals for re-grading any graded item must be made via email to the instructor no later than one week after the item is returned to you. In the appeal, you must describe (a) exactly what portion you wish to be re-graded and (b) the reasons you

are requesting the re-grading in a clear, concise manner. Only email appeals will be accepted.

##### Electronic Devices

Devices such as computers, tablets, mobile phones etc. should be turned off or set to silent mode before a class or lab begins, and should remain in this setting until the class or lab is over. You may not use a laptop, tablet, or any other electronic device during lectures unless you are specifically given permission to do so. No electronic device, with the exception of a standard calculator, will be allowed during exams.

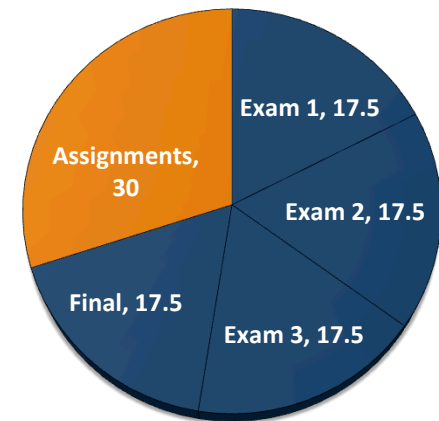
## Course grading

Ignore the percentages in shown in Canvas; do the math yourself.

Your *numeric score* for the course will be determined according to the following formula where EXAMS is the arithmetic average of your individual exam scores, ASSIGN is the arithmetic average of your individual programming assignment scores, and PART is the fraction of two points corresponding to the percentage of possible participation points that you earned.

$$\text{numeric score} = \text{EXAMS} * 0.7 + \text{ASSIGN} * 0.3 + \text{PART}$$

Your *letter grade* for the course will be calculated as follows. If  $\text{EXAMS} \geq 60$  and  $\text{ASSIGN} \geq 60$ , then your course letter grade will be assigned per the numeric score above and the standard 10-point scale (90-100 = A, 80-89 = B, etc.). If  $\text{EXAMS} < 60$  or  $\text{ASSIGN} < 60$ , then your course letter grade will be an F.



| E1     | E2     | E3     | Final  | EXAMS  | ASSIGN | W.Avg        | PART | N.Score      | Grade    |
|--------|--------|--------|--------|--------|--------|--------------|------|--------------|----------|
| 85.00  | 83.00  | 75.00  | 75.00  | 79.50  | 75.00  | <b>78.15</b> | 2.00 | <b>80.15</b> | <b>B</b> |
| 88.00  | 89.00  | 88.00  | 87.00  | 88.00  | 90.00  | <b>88.60</b> | 1.53 | <b>90.13</b> | <b>A</b> |
| 90.00  | 90.00  | 90.00  | 90.00  | 90.00  | 85.00  | <b>88.50</b> | 1.32 | <b>89.82</b> | <b>B</b> |
| 60.00  | 65.00  | 54.00  | 50.00  | 57.25  | 100.00 | <b>70.08</b> | 2.00 | <b>72.08</b> | <b>F</b> |
| 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 59.00  | <b>87.70</b> | 2.00 | <b>89.70</b> | <b>F</b> |
| 90.00  | 90.00  | 90.00  | 90.00  | 90.00  | 90.00  | <b>90.00</b> | 0.00 | <b>90.00</b> | <b>A</b> |

## Contacting me

### Instructor

Dr. Dean Hendrix

Office: 3127B Shelby Center

Phone: 334-844-6305

Email: [dh@auburn.edu](mailto:dh@auburn.edu)

Office Hours: 8:30am – 10:00am MWF

### Contacting me

**E-mail is best.     [dh@auburn.edu](mailto:dh@auburn.edu)**

**Please DO NOT send messages through Canvas.**

Drop by during office hours or make appt.