



South Portland, Maine 04106

Department of Computer and Information Sciences

Title: Data Structures

Catalog Number: CSCI 290

Credit Hours: 4

Total Contact Hours: 60

Lecture (or Lab): Lecture

Instructor: Anne Applin

Office Hours – Location: CSEC 025

Contact Information: Office phone: 207-741-5778

MW 8:00 – 9:30 am & 12:00 – 1:00 pm

Email: [aaapplin@smccme.edu](mailto:aapplin@smccme.edu)

Google Voice: 207-200-5853

Other hours available by appointment

Course Syllabus

Course Description

This course is an in depth study of abstract data types using the Java programming language. Topics include: stacks, queues, recursion, priority queues, lists, binary search trees, heaps, graphs, and an exploration and evaluation of sorting and searching algorithms. Most of these topics are designed to enhance the student's problem-solving and logical reasoning abilities. This course will have several programming projects that must be completed outside of class. **Prerequisite:** Successful completion of CSCI 160 Object-Oriented Design and Programming.

Course Objectives

After successfully completing the course, the student will be able to:

1. Articulate both verbally and in writing:
 - a. the concept of an abstract data type.
 - b. a stack and its operations at a logical level
 - c. a queue and its operations at a logical level
 - d. a tree and a binary tree at a logical level
 - e. the difference between a graph and a tree
 - f. a heap and its uses to solve computable problems
 - g. a graph and its uses to solve computable problems
 - h. recursion, its definition and the necessary conditions
 - i. the Big (O) of algorithms and what it means to the computing time of a program.
2. Develop the ability to traverse trees, graphs and heaps by hand
3. Select appropriate algorithms to solve well-formed problems
4. Demonstrate the ability to design using UML, and code using Java, programs that use stacks, queues, lists, trees, graphs or heaps as appropriate to solve computable problems
5. Implement recursive algorithms in Java

Topical Outline of Instruction

Lec	Date	Topic	Readings	Quiz	Start	Due
1	1/16	Intro to Data Structures	Review Chapter 1		Part 1	
2	1/18	Efficiency of Algorithms	Section 2.4	Quiz1		
3	1/23	Simple Sorts, Comparator, Comparable	Sec 8.1 – 8.5			
4	1/25	Array lists	Sec 2.1 – 2.3	Quiz2	Part 2	Part 1
5	1/30	Linked Lists	Sec 2.5 – 2.10			Homework 1
6	2/1	Iterators	Sec 2.7	Quiz3	Part 3	Part 2
7	2/6	Stacks	Chapter 3			
8	2/8	Queues	Chapter 4	Quiz4	Part 4	Part 3
9	2/13	Binary Trees terminology & properties	Sec 6.1			Homework 2
10	2/15	Binary tree traversals, Recursion	Sec 6.2 – 6.3	Quiz5	Part 5	Part 4
11	2/20	Binary Search Trees	Sec 6.4			
12	2/22	Anne at Conference – project work!				
13	2/27	Tree Iterators		Quiz6		Homework 3
14	3/1	Sets and Maps	Sec 7.1 – 7.2	Quiz7	Part 6	Part 5
15	3/6	Catch up and Review				
	3/8	Mid Term Exam				
	3/13	Spring Break				
	3/15	Spring Break				
16	3/20	Balanced Trees: AVL trees	Sec 9.1 – 9.2			
17	3/22	AVL Trees	Sec 9.1 – 9.2	Quiz8	Part 7	Part 6
18	3/27	2-3-4 trees, B-Trees	Sec 9.4 – 9.5			
19	3/29	Red/Black Trees	Sec 9.3	Quiz9		Homework 4
20	4/3	Skip List	Sec 9.6			
21	4/5	Union Find	See web link	Quiz10	Part 8	Part 7
22	4/10	Hash Tables	Sec 7.3 – 7.5			
23	4/12	Heaps and Priority Queues	Sec 6.5	Quiz11	Part 9	Part8
24	4/17	Fast Sorts: Heapsort, MergeSort	Sec 8.7 – 8.8			Homework 5
25	4/19	Quicksort, Radix Sort	Sec 8.9 & web link		Part 10	Part 9
26	4/24	Graph terminology & representation	Sec 10.1 – 10.3	Quiz12		
27	4/26	Dijkstra's Shortest Path	See web link			Part 10
28	5/1	Minimum Spanning Trees	See web link			
29	5/3	Graph traversals	Sec 10.4			Homework 6
	5/8	Final Exam part 1				
	5/10	Final Exam part 2				

Possibly incomplete subject to change. Coverage order will not change.

Lectures will be recorded and posted for snow days.

Course Requirements

Students will complete 10 programming assignments, take 1 exam in class and complete a two part final exam. All programming assignments can (and should) be done in teams of 2 or 3 students. You may NOT work alone on any of this. You should work with at least 5 other classmates during the semester Hand in only one copy of the finished project with who wrote what as part of the comments. Methods might be attributed to a single student, a Class might list two authors If any change is made to the existing code base, a revised by line should be added to the header comments for that method and the line or lines added should be attributed. If you need to change an existing line, comment it out and replace it with the new line – be sure to document the change including who did it and why.

Student Evaluation and Grading		Grading Scale:			
		93 – 100	A	73 - 76.99	C
8 Quizzes (10 drop 2)	20%	90 - 92.99	A-	70 - 72.99	C-
10 Programs	30%	87 - 89.99	B+	67 - 69.99	D+
1 Midterm	20%	83 - 86.99	B	63 - 66.99	D
Final Exam	30%	80 - 82.99	B-	0 - 62.99	F
		77 - 79.99	C+		

Text, Tools and / or Supplies

Data Structures: Abstraction and Design using JAVA, Second Edition" by Koffman and Wolfgang. USB or cloud storage for program backups. I strongly suggest using GIT hub as a repository for your code. Knowing how to use it will be one more skill you can claim on your resume. Do not share your solutions outside of your partner or other classmates.

Attendance Policy

You are expected to attend every class meeting. The key is communication. A student missing 3 consecutive class meetings without contacting the instructor will be dropped from the course. A student missing the equivalent of 3 weeks of class (6 class meetings) will be dropped if their current grade is a D or an F.

Handing in Assignments:

All assignments will be due at the beginning of class. Solutions will be discussed on the same day they are due.

Late Assignments:

Late assignments will be marked down 20% per lecture that they are late (except under special circumstances such as illness or other unanticipated impediments). Late assignments will also not be accepted after the last class lecture (unless a prior arrangement has been made.)

Collaboration:

Students are encouraged to assist each other in learning to understand the subject matter of this course. You will be expected to work cooperatively in class with other students groups of 2 or 3 students. All programming assignments must be done in teams of 2 to 3 students. You are expected to discuss the design together and to review each other's code. Turn in only 1 assignment per team. All work turned in must attribute individual authors for classes or methods. I need to know who wrote what and who revised what for what reason. You must change partners for each of the first 5 projects.

Crib Sheets:

Exams are closed book, however students will be allowed to prepare and use a one page crib sheet for each exam.

Google Voice Contact:

When texting or leaving voice mail on the Google contact number, please identify yourself first. I will see your number but no name so I need to know who is calling.

End-of-Course Evaluation

Students complete evaluations for each course attended at SMCC. Evaluations are submitted online and can be accessed through the student portal. Students can access the course evaluations beginning one week before the end of classes. The deadline for submission of evaluations occurs Monday at 5 p.m. following the last day of the class. You will receive an e-mail to your student e-mail account when course evaluations are available.

ADA Syllabus Statement

Southern Maine Community College is an equal opportunity/affirmative action institution and employer. For more information, please call (207) 741-5798. If you have a disabling condition and wish to request accommodations in order to have reasonable access to the programs and services offered by SMCC, you must register with the Disability Services Coordinator, Sandra Lynham, who can be reached at 741-5923. Further information about services for students with disabilities and the accommodation process is available upon request at this number. Course policies about online testing are modified to suit each individual's accommodations.

The Learning Commons:

The library, tutoring and writing centers, and open study space are located on the second floor of South Portland's Campus Center and in the Midcoast's LL Bean Learning Commons and Health Science Center. Here you can find free academic support through individual and online tutoring, information literacy/research librarians, and professional academic strategy/planning mentoring. There are many desktop and laptop computers as well as printers, reserve textbooks, and other academic tools available for use within the Learning Commons. Services are offered by appointment or as drop-in assistance. To access services, visit My Learning in My Maine Guide. Students consistently report that the Learning Commons is an inviting and friendly place to seek academic support or study. Those who make use of the Learning Commons regularly have been shown to be more likely to succeed—take advantage of this exceptional resource for this, or any of your classes.

SMCC Pay-for-Print Policy

Each semester students receive a \$20 printing credit. The balance resets at the end of the semester and any remaining credits are removed. The College's pay-for-print system monitors printing on all printers (including those in general access labs, library printers, Tutoring Services, Campus Center Lounge and technology labs). Be sure to log OUT of the system when you've finished your printing, to prevent unauthorized access to your account. Students can check the number of pages they have printed by using the Printing Balance tool available on SMCC computers (located in the lower right corner of the screen, near the clock). Departments with work study students who need to print documents for the department should contact the Help Desk at 741-5696 to have a special account set up. To find ways to reduce your printing charges, please go to the IT Help tab on My SMCC. If you have questions about the pay-for-printing policy or your printing charges, please contact the Help Desk at 741-5696 or send an e-mail to helpdesk@smccme.edu.

Refunds

Print jobs are eligible for a refund in the event of mechanical or electronic error on the part of the printer, print server, or software used to submit the job. Jobs are not eligible for a refund in cases where the job was not set up correctly, was submitted multiple times, or the student is not satisfied with the result. To request a refund, please bring the offending print to the IT Department in the basement of the Ross Technology Center. Refunds will be granted in the form of a credit to the student's account.

Add-Drop Policy

Students who drop a course during the one-week "add/drop" period in the fall and spring semesters and the first three days of summer sessions receive a 100% refund of the tuition and associated fees for that course. Please note any course that meets for less than the traditional semester length, i.e., 15 weeks, has a pro-rated add/drop period. There is no refund for non-attendance.

Withdrawal Policy

A student may withdraw from a course only during the semester in which s/he is registered for that course. The withdrawal period is the second through twelfth week of the Fall and Spring semesters and the second through ninth week of twelve-week Summer courses. This period is pro-rated for shorter-length courses, usually 75 percent of course meeting times; please check with the Registration Office. To withdraw from a course, a student must complete and submit the appropriate course withdrawal form, available at the Registration Office. This process must be completed either in person or by using SMCC e-mail accounts.

Plagiarism Statement

If an instructor suspects that a student has knowingly committed a violation defined in the Maine Community College System Policy on Student Grade Appeals and Academic Misconduct, the instructor has the authority to review the alleged misconduct and determine the grade that the student should receive for the assignment and the course. The instructor may assign a failing grade for the assignment or course and may require the student to complete additional work for the course. The instructor may consult with the department chair and/or the College's chief academic officer prior to making such decisions. If a student seeks to challenge an instructor's determination, the student should submit a grade appeal. Grade appeal forms are available in the Advising Office on the South Portland Campus or in the administrative offices in the Learning Commons on the Midcoast Campus. An instructor may also refer the matter to the College's disciplinary officer for review under the procedures of the MCCS Student Code of Conduct

The following shows what the revision history on a class written in Part 2 might look like. Newest revisions are at the top! It moves backwards in time.

```
/*
 * SearchByArtistPrefix.java
 * *****
 *
 *                revision history
 * *****
 * 1/31/18 Sarah Jones corrections to search method
 * 1/31/18 Sarah Jones testing code for search added to main
 * 1/30/18 Sarah Jones and Joe Smith - search method implemented
 * 1/29/18 Joe Smith - testing code added to main
 * 1/28/18 Sarah Jones - class CmpArtist implemented
 * 8/2015 Anne Applin - Added formatting and JavaDoc
 * 2015 Bob Booth - starting code
 * *****/
package student;
include java.util.Scanner;
/**
 * Search by Artist Prefix searches the artists in the song database
 * for artists that begin with the input String
 * @author booth
 */
```