SOUTHERN MAINE COMMUNITY COLLEGE
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South Portland, Maine 04106

Department of Computer and Information Sciences

Title: Data Structures

Credit Hours: 4

Lecture (or Lab): Lecture

Office Hours – Location: CSEC 025
MTWR 12:00 – 1:00 pm

Catalog Number: CSCI 290

Total Contact Hours: 60

Instructor: Anne Applin

Contact Information: Office phone: 207-741-5778
Email: 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	8/28	Intro to Data Structures	Review Chapter 1		Part1	
2	8/30	Efficiency of Algorithms	Section 2.4	Quiz1		
	9/4	Labor Day – No Class				
3	9/6	Simple Sorts, Comparator, Comparable	Sec 8.1 – 8.5			
4	9/11	Array lists	Sec 2.1 – 2.3	Quiz2	Part 2	Part 1
5	9/13	Linked Lists	Sec 2.5 – 2.10			Homework 1
6	9/18	Iterators	Sec 2.7	Quiz3	Part 3	Part 2
7	9/20	Stacks	Chapter 3			
8	9/25	Queues	Chapter 4	Quiz4	Part 4	Part 3
9	9/27	Binary Trees terminology & properties	Sec 6.1			
10	10/2	Binary tree traversals, Recursion	Sec 6.2 – 6.3	Quiz5	Part 5	Homework 2 Part 4
11	10/4	Binary Search Trees	Sec 6.4			
	10/9	Columbus Day, No Class				
12	10/11	Tree Iterators	See Web Link	Quiz6	Part 6	Part 5 Homework 3
13	10/16	Sets and Maps	Sec 7.1 – 7.2	Quiz7		
14	10/18	Mid Term Exam				
15	10/23	Balanced Trees: AVL trees	Sec 9.1 – 9.2		Part 7	Part 6
16	10/25	AVL Trees	Sec 9.1 – 9.2	Quiz8		
17	10/30	2-3-4 trees, B-Trees	Sec 9.4 – 9.5			
18	11/1	Red/Black Trees	Sec 9.3	Quiz9		Homework 4
19	11/6	Skip List	Sec 9.6		Part 8	Part 7
20	11/8	Union Find	See web link	Quiz10		
21	11/13	Hash Tables	Sec 7.3 – 7.5		Part 9	Part8
22	11/15	Heaps and Priority Queues	Sec 6.5	Quiz11		
23	11/20	Fast Sorts: Heapsort, MergeSort	Sec 8.7 – 8.8		Part 10	Part 9
24	11/22	Quicksort, Radix Sort	Sec 8.9 & web link			
25	11/27	Graph terminology & representation	Sec 10.1 – 10.3	Quiz12		Homework 5
26	11/29	Dijkstra's Shortest Path	See web link			Part 10
27	12/4	Minimum Spanning Trees	See web link			
28	12/6	Graph traversals	Sec 10.4			
29	12/11	Final Exam part 1				
30	12/13	Final Exam part 2				

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

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

8 Quizzes (10 drop 2)	20%
10 Programs	30%
1 Midterm	20%
Final Exam	30%

Grading Scale:

93 – 100	A	73 - 76.99	C
90 - 92.99	A-	70 - 72.99	C-
87 - 89.99	B+	67 - 69.99	D+
83 - 86.99	B	63 - 66.99	D
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 PM following the last day of the class. You will receive an email to your student email 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.

SMCC Pay-for-Print Policy

Per Page Costs

Each semester students receive a $20 printing credit. The balance resets at the end of the semester and any remaining credits are removed. The cost varies depending upon page size and whether printing is done in black and white or color.

a. There is a $0.10 per page fee for standard 8.5" by 11" black and white documents.
b. The reverse sides of duplex (double-sided) documents are free.
c. There is a $.50 per page fee for standard 8.5" by 11" color documents.
d. There is a $.20 per page fee for 8.5" by 14" (legal) or 11" by 17" (tabloid) black and white documents.
e. There is a $1.00 per page fee for 8.5" by 14" (legal) or 11" by 17" (tabloid) color documents.

Duplex charges (printing on both sides of a page) work in the following fashion: One page is $0.10, two pages are $0.10, three pages are $0.20, and four pages are $0.20, etc. The flipsides are free, but another sheet of paper is $0.10. Please be aware that a document with any color at all (when printed to a color printer) will by default be printed in color. You are responsible for setting the print job to print black and white if you do not need color. For directions, please go to the IT Help tab in My SMCC.

How does it work?

The College's pay-for-print system monitors printing on all printers (including those in general access labs, library printers, the Academic Achievement Center, Noisy Lounge and technology labs). 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.

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.

Why is SMCC charging for printing?

The pay-for-print system is an effort to control escalating printing costs. Charging for printing helps offset the increasing cost of supplies and encourages students to conserve resources. 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 email to helpdesk@smccme.edu.

Be sure to log OUT of the system when you've finished your printing, to prevent unauthorized access to your 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. To withdraw from a course, a student must complete and submit the appropriate course withdrawal form, available at the Enrollment Service Center (no phone calls, please). The designation "W" will appear on the transcript after a student has officially withdrawn. A course withdrawal is an uncompleted course and may adversely affect financial aid eligibility. Failure to attend or ceasing to attend class does not constitute withdrawal from the course. There is no refund associated with a withdrawal.

Plagiarism Statement

Adherence to ethical academic standards is obligatory. Cheating is a serious offense, whether it consists of taking credit for work done by another person or doing work for which another person will receive credit. Taking and using the ideas or writings of another person without clearly and fully crediting the source is plagiarism and violates the academic code as well as the Student Code of Conduct. If it is suspected that a student in any course in which s/he is enrolled has knowingly committed such a violation, the faculty member should refer the matter to the College's Disciplinary Officer and appropriate action will be taken under the Student Code of Conduct. Sanctions may include suspension from the course and a failing grade in the course. Students have the right to appeal these actions to the Disciplinary Committee under the terms outlined in the 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
 ***************************************************************************
 * corrections to search method by Sarah Jones 1/31/16
 * testing code for search added to main by Sarah Jones 1/31/16
 * search method implemented by Sarah Jones and Joe Smith 1/30/16
 * testing code added to main by Joe Smith 1/29/16
 * class CmpArtist implemented by Sarah Jones 1/28/16
 * revised by Anne Applin - Added formatting and JavaDoc 8/2015
 * starting code by Bob Boothe 2015
 ***************************************************************************
 * Search by Artist Prefix searches the artists in the song database
 * for artists that begin with the input String
 */
```