| Kirkwood Community College Course Syllabus<br>Data Structures<br>CSC-153<br>Fall 2017 | |
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| **INSTRUCTOR** | Cate Sheller |
| **INSTRUCTOR INFORMATION** | Office: 1170 Linn Hall<br>Office Hours: MWF, 1:25-2:20 PM; TR, 2:30-3:25 PM (or by appointment)<br>Office phone: 398-5899 ext. 5842<br>E-mail: cate.sheller@kirkwood.edu |
| **SECTION INFORMATION** | Synonym number: 0271903<br>Course meets Mondays and Wednesdays, 3:35 to 5:35 PM in room 1198 Linn Hall |
| **CREDIT HOURS** | 4 credit hours (4 lecture credits, 0 lab credits, 0 clinic credits, 0 internship credits). |
| **CONTACT HOURS** | 64 lecture hours, 0 lab hours, 0 clinic hours, 0 internship hours |
| **PREREQUISITES** | Computer Science (CSC142) or<br>Java II (CIS175) or<br>Java II (CIS176) |
| **COURSE DESCRIPTION** | Continues the study of program design and construction begun in CSC-142. Emphasizes data structures and practice in their specification, design, implementation and use. Includes container classes, arrays, lists, stacks, queues, trees, graphs, algorithm analysis, object-oriented programming, data abstraction, and searching and sorting techniques. |
| **REQUIRED COURSE MATERIALS** | **Required Text:** *Data Structures and Other Objects Using Java* by Michael Main, 4th edition; Addison Wesley, 2012<br>**Course web site:** http://faculty.kirkwood.edu/cshelle<br>**Flash drive**<br>**Optional:**<br>• personal computer<br>• Java SDK version 7.0 or later<br>• Java IDE (e.g. Eclipse, jgrasp or BlueJ)<br>Books and course materials for this course are available at the Kirkwood Bookstore. |
| **GENERAL EDUCATION OUTCOMES** | The Kirkwood faculty has identified the following general education outcomes as a major theme of this course.<br>• Students will think logically and critically.<br>• Students will understand and apply fundamental mathematic principles.<br>• Students will possess skills for further learning and the general workplace. |
| **COURSE STUDENT LEARNING OUTCOMES AND COMPETENCIES** | Upon completion of this course students will be able to:<br>1. Develop skills in the implementation and use of data structures and data abstraction.<br>2. Develop skill in algorithm analysis and verification.<br>3. Design and implement complex programs that are both functional and readable.<br>4. Develop advanced skills in the design and implementation of computer programs utilizing an object-oriented language. |
| **LATE WORK/MAKE-UP TEST POLICY** | • **You must take each exam at the scheduled time in order to receive full credit for the exam.** If you must miss an exam, contact me before the exam or as soon afterward as possible in order to arrange a make-up time.<br>• **Lab and homework assignments must be turned in prior to the exam to which they pertain**; late work will be penalized. **Program assignments must be turned in on time for full credit.** Late submissions (for **program** |

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| | **assignments only**) ***may*** be accepted, at instructor's discretion. Incomplete labs, homework, and programming assignments will be accepted for partial credit. Programs that do not compile, do not execute, or execute incorrectly should still be turned in. If you are having serious problems with an assignment, see me before the due date. |
| **CLASS ATTENDANCE POLICY AND COLLEGE SPONSORED ACTIVITIES** | As stated in the Student handbook: In compliance with Public Law 105-244, Kirkwood Community College makes a wide variety of general institutional information available to students. For additional information, go to: http://www.kirkwood.edu/site/index.php?p=32303<br><br>**Class attendance is strongly recommended**. If you miss class it is your responsibility to find out what you missed and catch up with scheduled course activities. Attendance is a key element in course success; you are much more likely to succeed if you are present and attentive. **In-class assignments may be given for which you will not receive credit if you are not present.** |
| **PRODUCTIVE CLASSROOM LEARNING ENVIRONMENT** | We believe that the best learning takes place in an environment where faculty and students exhibit trust and mutual respect.<br><br>In a productive learning environment, faculty and students work cooperatively, recognize and respect differences, model the values of character and citizenship, and become lifelong learners.<br><br>Turn off or leave home any devices (cell phone, etc.) that may distract you or your classmates. **You may bring a laptop computer or tablet to practice programming skills in class. You may not use these devices on exams**. |
| **PLAGIARISM POLICY** | See Student Policies: Academic and Enrollment Policies<br>http://www.kirkwood.edu/site/index.php?p=32303<br><br>**It is *cheating* to pass off another student's (or programmer's) work as your own.** This is plagiarism and is inappropriate behavior in an institution of higher learning. Don't do it. **If you collaborate with another person to complete a lab, program, or homework, you must clearly credit the other person's contribution.** Depending on the nature of the collaboration, and the degree of contribution you make, such collaboration may affect your grade. **Failure to give due credit to a collaborator will result in a zero.** |
| **CAMPUS CLOSINGS** | See Student Policies: General Policies and Student Rights<br>http://www.kirkwood.edu/site/index.php?p=32309<br><br>Local radio and TV stations will announce school closings as they received the information, but the best way to keep informed about class cancellations or delays is via the Kirkwood Alert System. This system will alert you via e-mail and/or text message of cancellations, delays, and emergencies. Sign up at http://alert.kirkwood.edu. |
| **ACADEMIC ACCOMMODATIONS** | Students with specific academic and/or classroom needs may request individualized accommodations. Students wishing to request accommodations should complete an 'Accommodation Request Form' which is available at the Learning Services office, 2063 Cedar Hall, or online at www.kirkwood.edu/accommodations. Students will be asked to provide documentation supporting their request. An accommodation plan must be completed each semester and given to instructors before academic accommodations will be provided. |
| **MIDTERM GRADES** | A midterm grade will be calculated and posted on EagleNet. The midterm grade is a grade-in-progress, and will not affect your official GPA, nor will it impact financial aid. The midterm grade has three purposes: first, to communicate your academic performance; second, to provide opportunities for you to discuss your progress with your instructor; and |

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<tr><th colspan="2">Kirkwood Community College Course Syllabus<br>Data Structures<br>CSC-153<br>Fall 2017</th></tr>
<tr><td></td><td>third, to allow Kirkwood to design college-wide intervention programs that will improve student success.</td></tr>
<tr><td>STUDENT EVALUATION</td><td>Your grade will be determined by the sum of the total points earned from the following assessment instruments:<ul><li>4 exams (400 points total)</li><li>10 quizzes (100 points total)</li><li>Total test points (400) will be taken from the top 3 exams plus all quizzes, or all 4 exams (no quizzes), whichever most benefits the student</li><li>Approximately 4 program assignments (25 points each; approximately 100 points total)</li><li>In-class assignments (5-10 points each; approximately 100 points total)</li></ul></td></tr>
<tr><td>GRADING SCALE</td><td><table>
<tr><td>A</td><td>>= 91</td><td>C</td><td>71-78.9</td></tr>
<tr><td>A-</td><td>90-90.9</td><td>C-</td><td>70-70.9</td></tr>
<tr><td>B+</td><td>89-89.9</td><td>D+</td><td>69-69.9</td></tr>
<tr><td>B</td><td>81-88.9</td><td>D</td><td>61-68.9</td></tr>
<tr><td>B-</td><td>80-80.9</td><td>D-</td><td>60-60.9</td></tr>
<tr><td>C+</td><td>79-79.9</td><td>F</td><td>< 60</td></tr>
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<tr><td>DROP DATE</td><td>To find the last day to get a refund, go to EagleNet for Students, then Search for Sections, then click the link for this term's Last Day to Drop and Refund Dates list.<br><br>http://www.kirkwood.edu/lastdaytodrop<br><br>The last date to drop this class for this term is November 17, 2017.<br><br>Details of the refund schedule can be found under Academic & Enrollment Policies at: http://www.kirkwood.edu/site/index.php?p=35066</td></tr>
<tr><td>FINAL EXAM INFORMATION</td><td>Final exams are scheduled during the last week of the term from December 8 to 14. The final exam for this class is scheduled on Friday, December 8 at 3:35 PM.</td></tr>
<tr><td>EMERGENCY INFORMATION</td><td>See Facilities: Emergency/Crisis Information<br><br>http://www.kirkwood.edu/site/index.php?p=7987</td></tr>
<tr><td>OTHER INFORMATION</td><td>Check Refund Policy at: http://www.kirkwood.edu/site/index.php?p=35066</td></tr>
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# **APPENDIX OF SPECIFIC LEARNER OUTCOMES:**

***Unit 1: Foundations***
**At the conclusion of this unit, students will be able to:**

1. Effectively document methods using pre and post-condition statements
2. Implement basic container classes including bags, lists, and sets
3. Write client applications that utilize basic container classes
4. Perform time analysis of program methods
5. Use Big-O notation to express results of algorithm analysis
6. Write programs that demonstrate information hiding
7. Define linked list classes and member functions
8. Implement doubly-linked lists and circular linked lists
9. Use linked lists to implement basic container classes
10. Write application programs that rely on linked list operations
11. Compare implementations of container classes that use arrays and linked lists, and explain the relative efficiencies, advantages and disadvantages of each
12. Recognize problems for which a recursive solution in most appropriate
13. Trace recursive operations using run-time stack illustrations
14. Use inductive reasoning to prove the effectiveness of recursive operations
15. Explain how to prevent infinite recursion in terms of variant expressions and threshold values
16. Hand-simulate and implement serial and binary search algorithms
17. Hand-simulate and implement hash table algorithms, using open-address, chained, and double hashing
18. Hand-simulate and implement sorting algorithms, including selectionsort, insertionsort, quicksort, and mergesort
19. Give examples of situations in which one sort or another is more or less efficient

**Unit 2: Basic Data Structures and Techniques**
**At the conclusion of this unit, students will be able to:**

1. Recognize situations in which inheritance can simplify implementation of groups of related classes
2. Implement super and sub classes
3. Implement derived classes and applications given an abstract superclass
4. Implement and utilize stacks
5. Use stacks to perform evaluation of arithmetic expressions in prefix, infix, and postfix forms
6. Implement and utilize queues and priority queues
7. Use queues in programs that simulate client/server scenarios
8. Explain tree-based concepts and algorithms using standard terminology
9. Design and implement classes and functions for binary tree nodes and generalized tree nodes
10. Hand trace binary search tree searches, insertions, removals and traversals
11. Implement binary search tree algorithms

**Unit 3: Advanced Tree Structures and Searching and Sorting Algorithms**
**At the conclusion of this unit, students will be able to:**

1. Determine whether or not a given tree satisfies the rules of a binary search tree, heap or B-tree
2. Perform insertion and removal of an item in a heap, with reheapification up or down, as necessary
3. Hand trace B-tree searches, insertions and removals
4. Use a B-tree to implement a Set class
5. Use a heap to implement a priority queue class
6. Explain graph-based algorithms using standard terminology
7. Design and implement graph classes
8. Hand-trace and implement depth-first and breadth-first graph traversal algorithms
9. Design and implement simple path algorithms

| CSC-153 Data Structures | | | |
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| Fall 2017 | | | |
| Tentative Schedule | | | |
| Date | Topic | Reading | Work Due |
| Mon, 08-21 | Course intro / Review of Java classes, objects, interfaces | Pp 1-15, 38-92 | |
| Wed, 08-23 | Arrays, ArrayLists, & Multidimensional arrays | Pp 104-111, 787-790 | |
| Mon, 08-28 | Quiz 1 / Lab 1 | | |
| Wed, 08-30 | Analysis of Algorithms: Time vs. Space, Big-O notation | Pp 16-35, 805-806 | Lab 1 |
| **Mon, 09-04** | **NO CLASS - LABOR DAY HOLIDAY** | | |
| Wed, 09-06 | Recursion | Pp 409-446 | Big-O exercises |
| Mon, 09-11 | Quiz 2 / Lab 2 / Exam Review | | |
| **Wed, 09-13** | **Exam 1** | | Lab 2 |
| Mon, 09-18 | Sorting Algorithms & Hash Tables | Pp 614-648, 581-601, 605-609 | Program 1 |
| Wed, 09-20 | Lab 3 / Quiz 3 | | |
| Mon, 09-25 | Simple Container Classes: Bags, Sets, Lists | Pp 103-165 | Lab 3 |
| Wed, 09-27 | Lab 4 / Quiz 4 | | |
| Mon, 10-02 | Linked Lists | Pp 175-244 | Lab 4 |
| Wed, 10-04 | Lab 5 / Quiz 5 | | |
| Mon, 10-09 | Catch-up / Exam review | | Lab 5 |
| **Wed, 10-11** | **Exam 2** | | |
| Mon, 10-16 | Generic methods, classes, & the Java Collections Framework | Pp 251-309 | |
| Wed, 10-18 | Stacks | Pp 315-354 | Program 2 |
| Mon, 10-23 | Lab 6 / Quiz 6 | | |
| Wed, 10-25 | Queues | Pp 360-404 | Lab 6 |
| Mon, 10-30 | Lab 7 / Quiz 7 | | |
| Wed, 11-01 | Intro to Binary Trees & Heaps | Pp 453-464, 520-524 | Lab 7 |
| Mon, 11-06 | Lab 8 / Quiz 8 | | |
| Wed, 11-08 | Linked Representation & Binary Search Trees | Pp 464-513 | Lab 8 |
| Mon, 11-13 | Catchup / Exam Review | | |
| **Wed, 11-15** | **Exam 3** | | Program 3 |
| **Mon, 11-20** | **NO CLASS - THANKSGIVING HOLIDAY** | | |
| **Wed, 11-22** | **NO CLASS - THANKSGIVING HOLIDAY** | | |
| Mon, 11-27 | Red-Black trees & B-trees | Pp 527-551, 558-563 | |
| Wed, 11-29 | Lab 9 / Quiz 9 | | |
| Mon, 12-04 | Graphs | Pp 728-771 | Lab 9 |
| Wed, 12-06 | Quiz 10 / Catchup / Exam Review | | |
| **Fri, 12-08** | **FINAL EXAM** | | Program 4 |

This workforce solution is funded by the IHUM Consortium which is 100% financed through a $15,000,000 grant from the U.S. Department of Labor's Employment & Training Administration. The product was created by the grantee and does not necessarily reflect the official position of the U.S. Department of Labor. The Department of Labor makes no guarantees, warranties, or assurances of any kind, express or implied, with respect to such information, including any information on linked sites and including, but not limited to, accuracy of the information or its completeness, timeliness, usefulness, adequacy, continued availability, or ownership.