WILLIAM JESSUP UNIVERSITY

Computer Science Major – Course Syllabus

**CSCI-561: “Data Structures and Algorithms”**

(3 units)

**Instructor**

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* Office hours: by appointments. Meet online using ZOOM or on San Jose campus

**Course Description**

Provides the core principles of computer science: algorithmic thinking and computational problem solving. Techniques for the design and analysis of efficient algorithms, emphasizing methods useful in practice. Topics include divide-and-conquer, binary heap and (balanced) binary search trees, dynamic programming, incremental improvement, complexity, and tree and graph algorithms.

**Course Objectives/Outcomes**

Upon completion of the course, students will have learned:

* different data structures and associated algorithms
* performance of algorithms and how to analyze them
* various techniques in deciding the right algorithms for problems

**Prerequisites**

Basic Python programming skills and knowledge of Python data structures like lists, strings, sets, and dictionaries.

**Textbook**

* (**Required**) Problem Solving with Algorithms and Data Structures Using Python second edition by Bradley N. Miller, [Franklin, Beedle & Associates](https://fbeedle.com/%22%20%5Ct%20%22_blank), 22 Sep 2013, ISBN-10: 1590282574, ISBN-13: 9781590282571. (The ebook is available online at <http://interactivepython.org/runestone/static/pythonds/index.html>)
* (Reference) Algorithms Illuminated: Part 1: The Basics, by Tim Roughgarden, 2017, ISBN: 0999282908
* (Reference) Algorithms Illuminated: Part 2: Graph Algorithms and Data Structures, by Tim Roughgarden, 2018, ISBN: 0999282921
* (Reference) Data Structures and Algorithms in Python, by Michael T. Goodrich and Roberto Tamassia, 2013,ISBN: 1118290279

**Supplemental Internet Resources**

The Internet may be used to find additional resources. Course participants are encouraged to alert others in the class when a true gem is found. This is best accomplished through the use of the course discussion forum and e*-mail or* other *online tool***.** Please take time to check regularly (at least weekly) for new posts.

**Course Content**

Review of asymptotic, basic data structures and algorithms. Techniques in sorting and searching

 1. Python Review (Assume Anaconda/Python was already installed.)

2. Algorithmic Analysis: Big-O notations

3. Basic Data Structures: Queues, Deques, Python Lists, Linked Lists, and their Applications.

4. Recursion, Searching, sorting with incremental and divide-by-conquer methods)

5. Trees and Tree Algorithms: Binary Heap, (Balanced) Binary search tree

6. Graphs and Graph Algorithms: BFS, DFS, topological order, strongly-connected-components, shortest path trees, minimum spanning trees and algorithms (Dijkstra’s and Prim’s).

**Grading**:

30% class exercises (quizzes and short answer questions)

70% weekly programming assignments (including your postings on weekly discussion forum)

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| DEFINITIONS  A=Distinguished  B=Above Average  C=Average  D=Minimum Passing  F=Failing | Percent  A = 90% —-100%  B = 80% — 89.9%  C = 70% — 79.9%  D = 60% — 69.9%  F =   0% — 59.9% |

**Late Policy**

2% penalties per weekday (10% per week). No works are accepted after the last day of the class.