# CS146 Course Assessment Report

**Author: Semester:**

## Part 1: Course Summary

### 1. Course Catalog Description:

|  |  |
| --- | --- |
|  | **Course Catalog Description** |
| **Course Description** | Implementations of advanced tree structures, priority queues, heaps, directed and undirected graphs. Advanced searching and sorting techniques (radix sort, heapsort, mergesort, and quicksort). Design and analysis of data structures and algorithms. Divide-and-conquer, greedy, and dynamic programming algorithm design techniques. |
| **Prerequisites** | MATH 030, MATH 042, CS 049J (or equivalent knowledge of Java), and CS 046B (with a grade of "C-" or better in each); or instructor consent. |

### 2. Course Learning Objectives:

|  |  |
| --- | --- |
| **Item** | **Objective Description** |
| CLO1 | Implement lists, stacks, queues, search trees, heaps, union-find ADT, and graphs and use these data structures in programs they design |
| CLO2 | Prove basic properties of trees and graphs |
| CLO3 | Perform breadth-first search and depth-first search on directed as well as undirected graphs |
| CLO4 | Use advanced sorting techniques (radix sort, heapsort, mergesort, quicksort) |
| CLO5 | Determine the running time of an algorithm in terms of asymptotic notation |
| CLO6 | Solve recurrence relations representing the running time of an algorithm designed using a divide-and-conquer strategy |
| CLO7 | Comprehend the basic concept of NP-completeness and realize that they may not be able to efficiently solve all problems they encounter in their careers |
| CLO8 | Comprehend algorithms designed using greedy, divide-and-conquer, and dynamic programming techniques |

### 3. Course Details:

See the course syllabus: <https://www.cs.sjsu.edu/private/adst/syllabi/CS146.html>

### 4. Program Outcomes Enabled/Assessed:

|  |  |
| --- | --- |
|   | **BSCS (BSSE) Outcomes Enabled** |
| **Course** | **a (1)** | **b (5)** | **c (3)** | **d (4)** | **e (6)** | **f (7)** | **g (8)** | **h (9)** | **i (11)** | **j** | **k** |
| CS146 | **3** | 2 | 2 | 3 |   |   |   |   | 2 | **3** | 2 |

An entry in a cell indicates that the course enables the corresponding outcome. The number (1, 2 or 3) indicates the level of achievement expected in the Course, 1 indicating Beginner, 2 Intermediate, and 3 Advanced.

Outcomes in parentheses indicate the corresponding BSSE program outcome. A complete list of BSCS outcomes can be found at: <http://www.sjsu.edu/cs/assessment/bscs/outcomes/>. A list of BSSE outcomes can be found at: <http://cmpe.sjsu.edu/bsse/outcomes/GEOutcomes/>

Bold face entries indicate the corresponding BSCS outcome is assessed for the course. Underlined entries indicate the corresponding BSSE outcome is assessed for the course.

Outcomes are assessed according to the following two year schedule:

|  |  |
| --- | --- |
| Semester | Outcomes Assessed |
| Spring 1 | a (1), j |
| Fall 1 | b (5), c (3), d (4) |
| Spring 2 | e (6), f (7), g (8) |
| Fall 2 | h (9), i (11), k |

## Part 2: Assessment Results

### BSCS Outcome a: An ability to apply knowledge of computing and mathematics to solve problems

### (BSSE Outcome a: An ability to apply knowledge of mathematics, science, and engineering)

|  |  |  |  |
| --- | --- | --- | --- |
| **Performance Indicator** | **1** | **2** | **3** |
| **beginning** | **satisfactory** | **exemplary** |
| **Calculate running time of a divide and conquer algorithm (assessed with an exam question)** | does not know how to calculate running time | some correct steps in calculation, but incorrect solution | correct solution |
| **Number of Students** |   |   |   |
|  |  |  |  |
| **Solve recurrence with Master Theorem (MT) (assessed with an exam question)** | does not know how to apply MT | correct steps but incorrect solution | successfully use MT to find correct solution |
| **Number of Students** |   |   |   |
|  |  |  |  |
| **Calculate running time of an algorithm given in pseudocode (for example sort algorithm) (assessed with an exam question)** | does not know how to calculate running time | some correct steps in calculation, but incorrect solution | correct solution |
| **Number of Students** |   |   |   |
|  |  |  |  |
| **Apply an operation in an instance of an advanced data structure (assessed with an exam question)** | fail to apply operation | some correct steps in application of operation, but incomplete | performs operation correctly |
| **Number of Students** |   |   |   |

### BSCS Outcome j: An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices

|  |  |  |  |
| --- | --- | --- | --- |
| **Performance Indicator** | **1** | **2** | **3** |
| **beginning** | **satisfactory** | **exemplary** |
| **Given an instance of data (eg. graph) and problem (eg. MST, search, shortest path), state and explain which algorithm would be best (assessed with an exam question)** | **wrong algorithm chosen** | **answer shows understanding of trade-off of algorithm in terms of space and time** | **correct answer, correctly analyzes relative costs of algorithms for specific data and problem** |
| **Number of Students** |  |  |  |
|  |  |  |  |
| **Given pseudocode of two algorithms (eg. sort), analyze which is more efficient** | **analysis incorrect** | **answer shows understanding of time/space efficiency of algorithm** | **correct answer, correctly analyzes relative costs of algorithm** |
| **Number of Students** |  |  |  |
|  |  |  |  |
| **Given a "real-life" problem, figure out which algorithm or data structure would be most helpful (assessed with an exam question)** | **algorithm or data structure does not solve problem** | **can explain how algorithm or data structure can solve problem** | **can explain how algorithm or data structure can solve problem better than other algorithms or data structures** |
| **Number of Students** |  |  |  |

## Part 3: Assessment Conclusions, Findings, and Recommendations

### BSCS/BSSE Outcome a conclusions

### BSCS Outcome j conclusions

### Findings and Recommendations