CSIT 265: DATA STRUCTURES AND ANALYSIS

1. Course Information

Subject
CSIT - Computer Science/ Information Technology

Course Number
265

School
Science, Technology, Engineering, Mathematics

Course Title
Data Structures and Analysis

2. Hours

Semester Hours
4.00000

Lecture
4

Lab
0

Practicum
0

3. Catalog Description

For display in the online catalog
This course examines the representation, implementation and application of data structures and their use in programs developed using the object-oriented paradigm. The data structures include lists, stacks, queues, dequeues, vectors, trees and graphs. Additional topics include array and linked list implementation, recursion, binary search tree, sequences and dictionaries. Algorithms are developed to operate upon these structures. All assignments will be programmed in a modern object oriented programming language. Open lab time required.

4. Requisites

Prerequisites
CSIT166

Corequisites
None

5. Course Type

Course Fee Code
3

Course Type for Perkins Reporting
vocational (approved for Perkins funding)

6. Justification

Describe the need for this course
This is a required course in all Computer Science AS degrees and an elective in the Computer Science/Information Technology AAS degree.

7. General Education

Will the college submit this course to the statewide General Education Coordinating Committee for approval as a course, which satisfies a general education requirement?

No

If the course does not satisfy a general education requirement, which of the following does it satisfy:

Program-specific requirement

8. Consistency with the Vision and Mission Statements, the Academic Master Plan, and the strategic initiatives of the College

Please describe how this course is consistent with Ocean County College's current Vision Statement, Mission Statement, Academic Master Plan, and the strategic initiatives of the College:

	Add item
1	Offer comprehensive educational programs that develop intentional learners of all ages and ensure the full assessment of student learning in these programs. (Mission Statement)
2	Foster educational innovation through effective teaching-learning strategies, designed to develop and nurture intentional learners who are informed and empowered. (Vision Statement)
3	Employ technology and learning outcomes assessment to ensure student success in an increasingly diverse and complex world. (Vision Statement)
4	Prepare students for entrance into the workforce and/or for successful transfer to other educational institutions. (Academic Master Plan)
5	Seek to empower students through the mastery of intellectual and Practical Skills. (Academic Master Plan)
6	Challenge students to transfer information into knowledge and knowledge into action. (Academic Master Plan)

9. Related Courses at Other Institutions

Comparable Courses at NJ Community Colleges

Institution

Brookdale CC

Course Title

Data Structures

Course Number

COMP-228

Number of Credits

3

Institution

Middlesex County College

Course Title

Data Structures in Java

Course Number

CSC-236

Number of Credits

4

Institution

Rowan College at Burlington County

Course Title

Introduction to Computer Science II

Course Number
CSE111

Number of Credits
3

Institution
Camden County College

Course Title
Computer Science II

Course Number
CSC223

Number of Credits
4

Institution
Mercer County CC

Course Title
Computer Science II Data Structures

Course Number
COS210

Number of Credits
4

Transferability of Course

Georgian Court University

Course Code, Title, and Credits	Transfer Catagory	If non-transferable; select status
CS227 Data Structures 3 credits	Minor	

Kean University

Course Code, Title, and Credits	Transfer Catagory	If non-transferable; select status
CPS 2232 Data Structures & Algorithm Analysis 4 credits	Major	

Monmouth University

Course Code, Title, and Credits	Transfer Catagory	If non-transferable; select status
CS305 Data Structures and Algorithms 4.0 credits	Major	

Rowan University

Course Code, Title, and Credits	Transfer Catagory	If non-transferable; select status
CS 04.222 Data Structures and Algorithms 4 credits	Major	

Rutgers - New Brunswick, Mason Gross School of the Arts

Course Code, Title, and Credits	Transfer Catagory	If non-transferable; select status
		Will not transfer

Stockton University

Course Code, Title, and Credits	Transfer Catagory	If non-transferable; select status
CSIS3103 Data Structures 4 credits	Major	

If not transferable to any institution, explain:
There is no known course on the Rutgers New Brunswick campus to which transfer credit will be given.

10. Course Learning Outcomes

Learning Outcomes

	Students who successfully complete this course will be able to:
CLO1	Analyze, using Big-O notation, the efficiency of algorithms
CLO2	Describe the core elements that encompass the collections framework
CLO3	Construct and implement linked structures including singly linked lists, circular lists, and doubly linked classes
CLO4	Develop data structures representing a stack, queue and priority queue
CLO5	Define and apply recursive algorithms
CLO6	Construct and implement search and hash algorithms
CLO7	Design and categorize various internal and external sorting algorithms
CLO8	Describe and implement trees including generic trees, binary search trees, and the Adelson, Veiskii and Landis (AVL) tree class
CLO9	Generate an implementation of the graph class

11. Topical Outline

(include as many themes/skills as needed)

	Major Themes/ Skills	Assignments (Recommended but not limited to)	Assessments (Recommended but not limited to)	Course Learning Outcome(s)
TO1	Analysis 1) Algorithms 2) Big-O Notation a) Constant Function b) Logarithmic Function c) Linear Function d) Log Function e) Quadratic Function f) Cubic Function g) Exponential Functions 3) Best-Case and Worst-Case Running Times	In-class Exercises	Exam	CLO1
TO2	The base data structures, abstraction and ADTs 1) Definition 2) Array Implementation 3) Multidimensional Arrays 4) Collection Framework 5) Application	Hands-on; In-class & Lab exercises	Programming Exercises; Exam	CLO2
TO3	Linked Lists 1) ADT 2) Dynamic 3) Singly and Doubly Linked Lists 4) Circular Linked Lists 5) Multiple Linked Lists 6) Application	Hands-on; In-class & Lab exercises	Programming Exercises; Exam	CLO3

TO4	Stacks 1) ADT 2) Implementing a Stack using an Array 3) Implementing a Stack using a generic linked list 4) Application	Hands-on; In-class & Lab exercises	Programming Exercises; Exam	CLO4
TO5	Queues 1) ADT 2) Circular Queues 3) Priority Queues 4) Application	Hands-on; In-class & Lab exercises	Programming Exercises; Exam	CLO4
TO6	Recursion 1) Implementation 2) Evaluation 3) Backtracking Algorithms 4) Parsing Algorithms	Hands-on; In-class & Lab exercises	Programming Exercises; Exam	CLO5
TO7	Trees 1) General Trees 2) Tree Traversal Algorithms 3) Binary Trees 4) Application	Hands-on; In-class & Lab exercises	Programming Exercises; Exam	CLO8
TO8	Maps and Dictionaries 1) Definition and implementation 2) Hash tables 3) Dictionary ADT	Hands-on; In-class & Lab exercises	Programming Exercises; Exam	CLO6
TO9	Search Trees 1) Definition and Implementation 2) Binary Search Trees 3) Infix, Prefix and Postfix 4) AVL Trees 5) Splay Trees	Hands-on; In-class & Lab exercises	Programming Exercises; Exam	CLO8
TO10	Sorting and Sets 1) Merge-Sort 2) Quick-Sort 3) Bucket-Sort and Radix-Sort 4) Comparing Sorting Algorithms	Hands-on; In-class & Lab exercises	Programming Exercises; Exam	CLO7
TO11	Graphs 1) Definition 2) Data Structures for Graphics 3) Graph Traversal 4) Directed Graphs 5) Weighted Graphs 6) Algorithms involving graphs a) Shortest Path b) Minimum Spanning Tree 7) Applications	Hands-on; In-class & Lab exercises	Programming Exercises; Exam	CLO9

12. Methods of Instruction

In the structuring of this course, what major methods of instruction will be utilized?

Class lecture, discussion, demonstrations, lab assignments, programs and online presentations.

13. General Education Goals Addressed by this Course (this section is to fulfill state requirements)

Information

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Technological Competency
Yes

Related Course Learning Outcome
CLO1-CLO9

Related Outline Component
TO1-TO11

Assessment of General Education Goal (Recommended but not limited to)
Mastering the basic skills necessary to take written specifications and turn them into a functional and well-organized computer program. Knowledge of data structure, uses and paradigms.

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Independent/Critical Thinking
Yes

Related Course Learning Outcome
CLO1-CLO9

Related Outline Component
TO1-TO11

Assessment of General Education Goal (Recommended but not limited to)
Mastering the basic skills necessary to take a problem statement and, using various data structures, turn it into a functional algorithm

14. Needs

Instructional Materials (text etc.):
Appropriate textbooks will be selected. Contact the department for current adoptions. Class notes, presentations, software and online materials.

Technology Needs:
College Portal and/or College Distance Learning Platform and/or Textbook or Instructor Website.

Human Resource Needs (Presently Employed vs. New Faculty):
Four (4) presently employed full-time faculty plus additional Adjunct Professors as needed.

Facility Needs:
Laboratory classrooms equipped with computer workstations, each configured to support program development using Java. Podium computer similarly equipped plus the ability to present audio-video presentations to the class.
Laboratory classrooms equipped with computer workstations, each configured to support data collection and processing. Podium computer similarly equipped plus the ability to present audio-video presentations to the class.

15. Grade Determinants

The final grade in the course will be the cumulative grade based on the following letter grades or their numerical equivalents for the course assignments and examinations

A: Excellent

B+: Very Good

B: Good

C+: Above Average

C: Average

D: Below Average

F: Failure

I: Incomplete

R: Audit

For more detailed information on the Ocean County College grading system, please see Policy #5154.

16. Board Approval

History of Board approval dates

Board of Trustees Approval Date: February 28, 2011
Board of Trustees Approval Date: March 26, 2012
PLT Approval of Form: May 22, 2012
Board of Trustees Approval Date: November 3, 2014
PLT Approval of Form: October 28, 2014
Approval of Form: September 2017
Board of Trustees Approval Date: November 5, 2020