Glendale College

Course Outline of Record Report

Course ID 005226

Revision - September 2023

Cyclical Review - August 2020

CS/IS212 : Advanced Data Structures

General Information

Author:	• Tony Biehl
Attachments:	DE Addendum_CS:IS_212 COR_08_01_2020 CoDE_09_26_2023.pdf.pdf
Course Code (CB01) :	CS/IS212
Course Title (CB02) :	Advanced Data Structures
Department:	CSIS
Proposal Start:	Fall 2024
TOP Code (CB03) :	(0706.00) Computer Science (transfer)
CIP Code:	(11.0701) Computer Science.
SAM Code (CB09) :	Non-Occupational
Distance Education Approved:	Yes
Will this course be taught asynchronously?:	Yes
Course Control Number (CB00) :	CCC000587385
Curriculum Committee Approval Date:	09/13/2023
Board of Trustees Approval Date:	11/21/2023
Last Cyclical Review Date:	08/01/2020
Course Description and Course Note:	CS/IS 212 is designed to provide a thorough coverage of data structures with data abstraction applied to a broad spectrum of practical applications. Students who take this course master the principles of programming as a tool for problem solving. Students solve practical problems in a computer-equipped laboratory using an object oriented programming language, such as JAVA. Some specific topics covered include hash tables, trees, persistent structures, indexed files, and databases.
Justification:	DE Change
Academic Career:	• Credit

Academic Senate Discipline

Primary Discipline:	• Computer Science
Alternate Discipline:	No value
Alternate Discipline:	No value

Course Development

Basic Skill Status (CB08)

Course is not a basic skills course.

☐ Allow Students to Gain Credit by Exam/Challenge

Course Special Class Status (CB13)

Course is not a special class.

Pre-Collegiate Level (CB21)

Not applicable.

Grading Basis

- Grade with Pass / No-Pass Option

Course Support Course Status (CB26)

Course is not a support course

Transferability & Gen. Ed. Options

General Education Status (CB25)

Not Applicable

Transferability

Transferable to both UC and CSU

Transferability Status

Approved

Units and Hours

Summary

Minimum Credit Units (CB07)	3
Maximum Credit Units (CB06)	3
Total Course In-Class (Contact) Hours	90
Total Course Out-of-Class Hours	72
Total Student Learning Hours	162

Credit / Non-Credit Options

Course Type (CB04)

Credit - Degree Applicable

Noncredit Course Category (CB22)

Credit Course.

Noncredit Special Characteristics

No Value

Course Classification Code (CB11)

Credit Course.

☐ Variable Credit Course

Funding Agency Category (CB23)

Not Applicable.

☐ Cooperative Work Experience Education Status (CB10)

Weekly Student Hours

	In Class	Out of Class
Lecture Hours	2	4
Laboratory Hours	3	0

Course Student Hours

Course Duration (Weeks)	18
Hours per unit divisor	54
Course In-Class (Contact) Hours	

Studio Hours	0	0	Lecture	36
			Laboratory	54
			Studio	0
			Total	90
			Course Out-of-Class Hours	
			Lecture	72
			Laboratory	0
			Studio	0
			Total	72

Time Commitment Notes for Students

No value

Pre-requisites, Co-requisites, Anti-requisites and Advisories

Prerequisite

CS/IS211 - Data Structures

Objectives

- Create computer programs using data structures such as arrays, records, strings, linked lists, stacks, queues, and hash tables.
- Create simple recursive functions and procedures.
- Create simple programs in an object-oriented programming language.
- Explain how abstraction mechanisms aid in creating reusable software components.

Entry Standards

Entry Standards

No value

Specifications

Methods of Instruction

Methods of Instruction	Lecture
Methods of Instruction	Demonstrations

Methods of Instruction	Laboratory

Out of Class Assignments

- Homework exercises (e.g. develop ADTs, explain advantages and disadvantages of solutions, etc.)
- Programming problems (e.g. programming trees, binary trees, full binary trees, and complete binary trees)

Methods of Evaluation	Rationale
Exam/Quiz/Test	Final exam
Exam/Quiz/Test	Midterm examinations and quizzes

Textbook Rationale

No Value

Textbooks

Author	Title	Publisher	Date	ISBN
Carrano, Frank	Data Abstraction and Problem Solving with C++: Walls and Mirrors.	New York: Addison Welsey.	2016	978-0134463971

Other Instructional Materials (i.e. OER, handouts)

No Value

Materials Fee

No value

Learning Outcomes and Objectives

Course Objectives

Create computer programs solving more complex OOP problems.

Explain more complex abstract data types such as trees, graphs, hash tables, and heaps.

Explain queues, deques, and priority queues.

Explain and program binary trees, full binary trees, and complete binary trees.

Explain 2-3 trees and n-trees and their advantages.

SLOs

Design and develop a complex object oriented programs. Expected Outcome Performance: 70.0

ILOs Core ILOs	Analyze and solve problems using critical, logical, and creative thinking; ask questions, pursue a line of inquiry, and derive conclusions; cultivate creativity that leads to innovative ideas.
	Demonstrate depth of knowledge in a course, discipline, or vocation by applying practical knowledge, skills, abilities, theories, or methodologies to solve unique problems.
CSIS Information Technology Certificate	Demonstrate installing, configuring and maintaining computer and mobile devices, including diagnosing, resolving and documenting common hardware and software.
CSIS Information Technology - A.S. Degree Major	Demonstrate installing, configuring, and maintaining computer and mobile devices, including diagnosing, resolving, and documenting common hardware and software.
CSIS Computer Science - A.S. Degree Major	Prepare a software project to implement a single scientific, mathematical, business, or technical function.
CSIS Computer Science - Certificate	Prepare a software project to implement a single scientific, mathematical, business, or technical function.
CSIS Computer Software Technician	demonstrate the ability to independently create, save, modify and print a document using a word processing program and appropriate assistive technology
CSIS Web Development - A.S. Degree Major	use industry standard tools and techniques to produce, publish and maintain Web sites and Web content.
CSIS Web Development - Certificate	use industry standard tools and techniques to produce, publish and maintain Web sites and Web content.

Analyze and explain complex abstract data types. Expected Outcome Performance: 70.0

ILOs Core ILOs	Analyze and solve problems using critical, logical, and creative thinking; ask questions, pursue a line of inquiry, and derive conclusions; cultivate creativity that leads to innovative ideas.
	Communicate clearly, ethically, and creatively; listen actively and engage respectfully with others; consider situational, cultural, and personal contexts within or across multiple modes of communication.
CSIS Information Technology Certificate	Demonstrate installing, configuring and maintaining computer and mobile devices, including diagnosing, resolving and documenting common hardware and software.
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CSIS Web Development - Certificate	use industry standard tools and techniques to produce, publish and maintain Web sites and Web content.
CSIS Web Development - A.S. Degree Major	use industry standard tools and techniques to produce, publish and maintain Web sites and Web content.

Apply use of trees and understanding of terminology. Expected Outcome Performance: 70.0

ILOs Core ILOs	Demonstrate depth of knowledge in a course, discipline, or vocation by applying practical knowledge, skills, abilities, theories, or methodologies to solve unique problems.
CSIS Information Technology Certificate	Demonstrate installing, configuring and maintaining computer and mobile devices, including diagnosing, resolving and documenting common hardware and software.
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Additional SLO Information

Does this proposal include revisions that might improve student attainment of course learning outcomes?

No Value

Is this proposal submitted in response to learning outcomes assessment data?

No Value

If yes was selected in either of the above questions for learning outcomes, explain and attach evidence of discussions about learning outcomes.

No Value

SLO Evidence

No Value

Course Content

Lecture Content

Review of Basic Algorithms (3 hours)
- Recursive solutions
- Array Searching
- File searching

Linked Lists (3 hours)
- List implementations that use arrays
- List implementations that link data
- Inheritance and lists
- Sorted lists

Stacks (3 hours)
- The Abstract Data Type (ADT) stack
- Simple application of the ADT stack
- Applications utilizing Postfix and Infix expressions
- The relationship between stacks and recursion

Queues (3 hours)
- Queues
- Deques
- Priority queues

Class Relationships (3 hours)
- Inheritance revisited
- Dynamic binding and abstract classes
- Applications
- Advantages of an objects-oriented approach

Trees (5 hours)
- Terminology
- The ADT binary tree
- The ADT binary search tree
- General trees
- AVL
- 2-3 trees

Advanced Implementation of Tables (4 hours)
- Balanced search trees
- Hashing
- Data with multiple organizations

Graphs (4 hours)
- Terminology
- Graphs as ADT
- Graph traversals
- Applications of graphs

External Methods (4 hours)
- External storage
- Sorting data in an external file
- External tables

Advanced Topics in Data Structures (4 hours)

Total Hours: 36

Laboratory/Studio Content

Review of Basic Algorithms (4 hours)
- Recursive solutions
- Array Searching
- File searching

Linked Lists (4 hours)
- List implementations that use arrays
- List implementations that link data
- Inheritance and lists
- Sorted lists

Stacks (5 hours)
- The Abstract Data Type (ADT) stack
- Simple application of the ADT stack
- Applications utilizing Postfix and Infix expressions
- The relationship between stacks and recursion

Queues (5 hours)
- Queues
- Deques
- Priority queues

Class Relationships (5 hours)
- Inheritance revisited
- Dynamic binding and abstract classes
- Applications
- Advantages of an objects-oriented approach

Trees (9 hours)
- Terminology
- The ADT binary tree
- The ADT binary search tree
- General trees
- AVL
- 2-3 trees

Advanced Implementation of Tables (5 hours)
- Balanced search trees
- Hashing
- Data with multiple organizations

Graphs (5 hours)
- Terminology
- Graphs as ADT
- Graph traversals
- Applications of graphs

External Methods (6 hours)
- External storage
- Sorting data in an external file
- External tables

Advanced Topics in Data Structures (6 hours)

Total Hours: 54