Republic of the Philippines
SULTAN KUDARAT STATE UNIVERSITY
Isulan, Sultan Kudarat
College of Computer Studies
S.Y. 2024-2025

UNIVERSITY VISION

A trailblazer in arts, science and technology in the region.

UNIVERSITY MISSION

The University shall primarily provide advance instruction and professional training in science and technology, agriculture, fisheries, education and other related field of study. It shall undertake research and extension services, and provide progressive leadership in its area of specialization.

UNIVERSITY GOAL

To produce graduates with excellence and dignity in arts, science and technology.

UNIVERSITY OBJECTIVES

a. Enhance competency development, commitment, professionalism, unity and true spirit of service for public accountability, transparency and delivery of quality services;
b. Provide relevant programs and professional trainings that will respond to the development needs of the region;
c. Strengthen local and international collaborations and partnerships for borderless programs;
d. Develop a research culture among faculty and students;
e. Develop and promote environmentally-sound and market-driven knowledge and technologies at par with international standards;
f. Promote research-based information and technologies for sustainable development;
g. Enhance resource generation and mobilization to sustain financial viability of the university.

Program Objectives and its relationship to University Objectives:

PROGRAM OBJECTIVES (PO)	UNIVERSITY OBJECTIVES						
A graduate of BS Computer Science can:	a	b	c	d	e	f	g
a. Design and implement effectively the innovative computing researches	/	/		/	/	/	/
b. Apply proficiently the algorithmic theories and related computational system in conducting researches;	/	/	/	/	/	/	/
c. design industry-based applications, infrastructures and technologies that will promote the advancement and development of the community;	/	/	/		/	/	/
d. demonstrate the code of conduct as well as the social and legal aspects of information technology	/	/		/	/	/	/

1. Course Code : CC114
2. Course Title : Data Structure and Algorithm
3. Prerequisite :
4. Credits : 3 UNITS

5. Course Description:

This course includes the basic foundations in of data structures and algorithms. This course concepts of various data structures like stack, queue, list, tree and graph. Additionally, the course includes idea of sorting and searching

6. Course Learning Outcomes and Relationships to Program Objectives

Course Learning Outcomes	Program Objectives				
At the end of the semester, the students can:	a	b	c	d	e
a. Understand the fundamental concepts of data structure and algorithms	/		/	/	/
b. Implement and analyze various data structures such as stacks, queues, list, trees, and graphs	/	/		/	/
c. Apply appropriate data structures to solve computational problems efficiently	/		/	/	/
d. Demonstrate proficiency in sorting and searching algorithms	/	/	/	/	
e. Evaluate the performance of different data structures and algorithms in terms of time and space complexity	/	/	/		/
f. Develop problem-solving skills by implementing data structures and algorithms in programming.	/	/	/	/	/

7. Course Content

Course Objectives, Topics, Time Allotment	Desired Student Learning Outcomes	Outcomes-Based Assessment (OBA) Activities	Evidence of Outcomes	Course Learning Outcomes	Program Objectives	Values Integration
1. Topic: SKSU VMGO, Classroom Policies, Course Overview, Course Requirements, Grading System (2 hour)						
1. Discuss the VMGO of the university, classroom policies, scope of the course, course requirements and grading system	1.1 Student can be aware of and appreciate of the university's VMGO, classroom policies, course overview, requirements and grading system.	Individual participation in class discussion and group presentation	Group and individual discussions			Value of appreciation
2. Topic: Introduction to Data Structures & Algorithm (6 hours)						
2.1 Data types, Data Structure and Abstract data type	2.1 Students can define and explain the purpose of data structure and algorithm	Discussions and Lectures	Group and individual discussions	a, d, e, f	a, c, d	Unity and teamwork
2.2 Dynamic memory allocation in C	2.2 Students can discuss the Memory Allocation	Problem Solving by Group	Rubrics Score Card for Group Activities	a, d, e, f	a, b, c	Value of learning
2.3 Introduction to Algorithm	2.3 Students can discuss the importance of Algorithm	Laboratory Activities	Graded Laboratory Activities	a, b, c, d	a, b, c	Value of newly acquired ideas

2.4 Asymptotic notations and common functions	2.5 Students can discuss the Asymptotic notations and common functions	Hands-on Activities Synchronous / Asynchronous Lecture	Graded Hands-on Activities	a, b, c, d	a, b, c	Value of focus
3. Functions (8 hours)		-				
3.1 Defining the Function Parts of Function Calling a Function Actual vs. Formal Parameter	3.1 Students can define what a function is and explain its purpose in programming	Discussions and Lectures	Group and individual discussions	a, d, e, f	a, c, d	Value of learning
3.2 Function within No Parameter and Return Value • Function with No Parameter but with Return Value • Function with Parameter and No Return Value • Function with Parameter and Return Values	3.2 Students can write and execute a function with no parameters and no return value.	Individual Problem Solving Laboratory Activities	Rubrics Score Card for Group Activities Graded Laboratory Activities	a, d, e, f a, b, c, d	a, b, c a, b, c	Value of newly acquired ideas Value of focus
3.3 Recursive Functions	3.3 Students can explain the concept of **recursion** and how it differs from iteration	Hands-on Activities Synchronous / Asynchronous Lecture	Graded Hands-on Activities	a, b, c, d	a, b, c	
4.Topic: Structure (8 hours)						
4.1 Structure	4.1 Student c an u understand the concept of **structures** and can declare a structure using appropriate syntax	Power Point Presentation Discussions and Lectures	Quiz Graded Group Activities	a, b, d a, b, d	a, b, c a, b, c	Value of ideals Value of learning
4.2 Passing Structures as Parameters	4.2 Student can differentiate between **passing structures by value** and **passing structures**	Group Activities				

	by reference (using pointers).	Synchronous / Asynchronous Lecture				
5. Topic: Pointer (8 hours)						
5.1 Discuss what is Pointer	5.1 Student can define what a **pointer** is and explain its role in memory management.	Discussion/Lecture Activities	Quiz	a, b, d	a, b, e	Unity and teamwork
5.2 Discuss the pass reference in function Using Pointer	5.2 Students can explain how **pointers enable pass by reference**, allowing functions to modify the original variables.	Laboratory Activities Synchronous / Asynchronous Lecture	Graded Laboratory Exam	a, b, c	a, b, c, e	Value of handwork
6. Topic: Dynamic Data Structure(8 hours)						
6.1 Discuss the Principle Dynamic Memory Allocation	6.1 Students can explain the **concept of dynamic memory allocation** and how it differs from static memory allocation.	Group Discussion Group Activities	Quiz Graded Group Quiz	a, b, c, d a, b, c	a, b, c, e a, b, c, e	Value of Participation Value of Teamwork
6.2 Discuss the Dynamic Arrays and Dynamic Structs	6.2 Students can explain how **dynamic arrays** are created	Question and Answer Activities	Graded score for question-and-answer activities	a, b, c, d	a, b, c	Value of Participation

	and managed using pointers and dynamic memory functions. Synchronous / Asynchronous Lecture					
7. Topic: Linked List (2 hours)						
7.1 Discuss the basic Concept of List , nodes and its Implementation of Lists 7.2 Discuss the link List, Singly Linked list, Doubly Linked list and Circular Linked List 7.3 Implement the Basic Operation in Linked List: Node Creation, Node Insertion and Deletion from Beginning , End and Specified Position 7.4 Discuss the Stack and Queue as Linked List	7.1 Students can explain the basic Concept of List and ADT, to include the Implementation of Lists 7.2 Students can discuss the Link List, Singly Linked List, Doubly Linked list and Circular Linked List 7.3 Students can Implement the Basic Operation in Linked List, Node insertion, deletion from Beginning , end and Specified Position. 7.4 Students can discuss the stack and Queue as Linked List	Group Discussion Board Work Problem Solving Hands-on Activities Synchronous / Asynchronous Lecture	Graded Recitation . Graded Score for Board Work Activity Graded Hands-on Exam	a, b, c a, b, c a, b, c, d	a, b, c a, b, c, e a, b, c, d, e	Unity and teamwork Value of participation Value of Exploration
8. Topic: Stacks (10 hours)						

8.1 Discuss the Introduction of Stacks 8.2 Discuss the stacks Operation 8.3Discuss the application and use case of stacks	8.1 Students can define what a **stack** is in data structures and describe its **LIFO (Last In, First Out)** principles 8.2 Student can perform fundamental **stack operations** 8.3 Student can recognize and describe **real-life and programming scenarios** where stacks are used.	Interactive Discussions and Lectures Individual Board Work Activity Group Discussion Synchronous / Asynchronous Lecture	Graded Question and Answer Activities Graded Score for Board Work Activity Quiz	a, b, c a, b, c a, b, c, d	a, b, c, d a, b, c, d a, b, c, d, e	Value of determination Value of Ideas Value of helping others
9.Topic : Queue (10 hours)						
9.1 Discuss the Introduction of queue 9.2 Discuss the Queue Operation And its implementation	9.1 Student can define what a **queue** is in data structures and explain its **FIFO (First In, First Out)** principle. 9.2 Student can describe and perform basic **queue operations.**					

10 . Topic: Tree (10 hours)						
10.1 Discuss the Introduction of Tree	10.1 Student can define what is **tree** in data structures and describe its **hierarchical nature**.	Interactive Discussions and Lectures Problem Solving Activities	Graded Recitations Quiz	a, b, c, d a, b, c	a, b, c, d a, b, c, d, e	Value of learning Value of Participation
11.2 Discuss the Binary Search Tree Operations	11.2 Student can define a **Binary Search Tree (BST)** and explain how it maintains order using the left < root < right rule.	Board Work Problem Solving	Graded Score for Board Work Activity Quiz	a, c, d a, b, c, d	a, b, c, d, e a, b, c, d, e	Value of Exploration Value of Learning
11 .3 Discuss the Binary Tree Traversal	11.3 Student can explain the purpose of **tree traversal** and understand the difference between **depth-first** and **breadth-first** traversal.	Power Point Presentation Synchronous / Asynchronous Lecture				
12 Topic: Array Sorting Algorithm(16 hours)						
12.1. Discuss the Concept and its implementation of the following algorithm - Bubble Sort - Insertion Sort - Selection Sort -Counting Sort - Quick Sort - Merge Sort	12. 1 Student can understand the **importance of sorting** in data processing and algorithm optimization. - Student can explain the concept of **Bubble Sort** as a comparison-based sorting algorithm.	Interactive Discussions and Lectures	Graded Recitations Graded Score for Hands-on Activities	a, b, c a, b, c, d	a, b, c, d a, b, c, f	Value of Ideas Value of Exploration

	- Student can describe how **Insertion Sort** builds the sorted array one element at a time. - Student can explain the working of **Selection Sort** by repeatedly selecting the minimum element from the unsorted part. - Student can u understand the concept of **non-comparison sorting** used in Counting Sort. - Student can describe the **divide-and-conquer** strategy used in **Quick Sort**. - Student can understand how **Merge Sort** recursively divides the array and then merges sorted subarrays.	Hands-on Activities Board Work Problem Solving Synchronous / Asynchronous Lecture				

Total number of hours with laboratory (94 hours)

Lectures	36 hours
Laboratory	54 hours
Examination	4 hours

8. Course Evaluation

Course Requirements **:** 80% running program

Grading System:

MID-TERM and **FINAL-TERM**

Participation/Attendance	10%
Assignment	5%
Quiz	15%
Seatwork/lab exercises	20%
Exam	50%

Schedule of Examination:

Midterm
Final Term
Classes End

References:

Textbooks:

Y langsam , MJ Augenstein and A.M. Tanenbaum Data Structures using C and C++ Prentice Hall India, Second Edition 2015

Reference Books:

Leen Ammeral, Programmes and Data Structures in C, Wiley Professional Computing
G.W. Rowe, Introduction to Data Structures and Algorithm with C and C++, Prentice Hall India
R.L. Kruse, B.P. Leung, C.L. Tondo, Data Structure and Program Design in C, Prentice Hall India

Supplemental:

https://www.tutorialspoint.com/data_structures_algorithms/index.htm
https://www.studytonight.com/data-structures/introduction-to-data-structures
https://www.javatpoint.com/data-structure-tutorial
https://www.geeksforgeeks.org/why-data-structures-and-algorithms-are-important-to-learn/

Prepared by:

CECILIA E. GENER
Faculty

Reviewed by:

CECILIA E. GENER, PhD
Program Chairman, BSCS

Approved by:

BENEDICT A. RABUT, DIT
Dean, College of Computer Studies