



### **Course Description**

#### **COP3530 | Data Structures | 4.00 credits**

This upper division course is for students majoring in B.S. in Information Systems Technology. The student will learn the fundamentals of data structures using the Java programming language. The students will learn to design, implement and use data structures to organize and store data in a computer so that it can be accessed and modified efficiently. Prerequisite: COP2800.

### **Course Competencies:**

**Competency 1:** The student will have an understanding of Algorithm Analysis by:

1. Describing the role of algorithms in computing
2. Estimating the running time of different algorithms using Big-Oh notation
3. Describing how to reduce the running time of a program from days or years to fractions of a second
4. Describing binary search algorithm and its running time

**Competency 2:** The student will demonstrate an understanding of and proficiency in the use of Linked Lists by:

1. Describing and defining the general concept of a Linked List
2. Implementing and using singly and doubly linked lists
3. Implementing and using circular linked lists
4. Sorting the components of a linked list into ascending or descending order using various sorting techniques
5. Searching for a specific value in a sorted list using several search techniques

**Competency 3:** The student will demonstrate an understanding of and proficiency in the use of Stacks and Queues by:

1. Describing and defining the general concept of Stacks
2. Implementing and using Stacks
3. Describing and defining the general concept of Queues
4. Implementing and using Queues

**Competency 4:** The student will demonstrate an understanding of and proficiency in the use of Trees by:

1. Describing and defining the general concept of Trees.
2. Implementing and using binary trees.
3. Implementing tree traversal algorithms.
4. Searching for a specific value in a tree using several search techniques.

**Competency 5:** The student will demonstrate an understanding of and proficiency in the use of Hashing by:

1. Describing and defining the general concept of Hash Functions.
2. Implementing and using different Hash Functions.
3. Describing and implementing different methods used to resolve hash collisions.

**Competency 6:** The student will demonstrate an understanding and proficiency in the use of Priority Queues by:

1. Describing and defining the general concept of Priority Queues.
2. Implementing and using different types of Priority Queues.
3. Identifying the different applications where Priority Queues are used.

**Competency 7:** The student will demonstrate an understanding and proficiency in the use of Sorting by:

1. Describing and defining the general concept of Sorting.
2. Implementing and using different types of internal Sorting algorithms.

3. Implementing and using different types of external Sorting algorithms.

**Learning Outcomes:**

- Use quantitative analytical skills to evaluate and process numerical data.
- Use computer and emerging technologies effectively.