NCAAA

اعتماد

T4

2020

# Course Specifications

| **Course Title:** | Data Structures |
|---|---|
| **Course Code:** | 501324-3 |
| **Program:** | Bachelor in Information Technology |
| **Department:** | Department of Computer Science |
| **College:** | Computers and Information Technology |
| **Institution:** | Taif University |

# Table of Contents

# A. Course Identification

| 1. Credit hours:3 |
|---|

**2. Course type**

a.      University ☐    College ☐    Department ☑       Others ☐

b.          Required ☑      Elective ☐

| 3. Level/year at which this course is offered:    5/3 |
|---|
| 4. Pre-requisites for this course (if any)**: 501222-3 (Programming 2)** |
| 5. Co-requisites for this course (if any)**: NON** |

## 6. Mode of Instruction (mark all that apply)

| No | Mode of Instruction | Contact Hours | Percentage |
|---|---|---|---|
| 1 | Traditional classroom | 3 | 100% |
| 2 | Blended | 0 | 0 |
| 3 | E-learning | 0 | 0 |
| 4 | Distance learning | 0 | 0 |
| 5 | Other (Lab) | 2 | 0 |

## 7. Contact Hours (based on academic semester)

| No | Activity | Contact Hours |
|---|---|---|
| 1 | Lecture | 50 |
| 2 | Laboratory/Studio | 30 |
| 3 | Tutorial | 0 |
| 4 | Others (specify) | 0 |
|  | Total | 75 |

# B. Course Objectives and Learning Outcomes

**1. Course Description**

Introduces students to development, implementation, and analysis of efficient data structures and algorithms. Topics include analysis of sorting and searching algorithms and abstract data types such as stacks, queues, linked list, trees, graphs, and hash tables.

**2. Course Main Objective**

To develop students' knowledge in data structures and the associated algorithms, introduce the concepts and techniques of structuring and operating on Abstract Data Types in problem solving, discuss common sorting, searching and graph algorithms, study the complexity and comparisons among these various techniques and apply and implement learned algorithm design techniques and data structures to solve problems.

## 3. Course Learning Outcomes

| | CLOs | Aligned PLOs |
|---|---|---|
| 1 | **Knowledge and Understanding:** | |
| 1.1 | Understand pointer and the linked list data structure to solve problems. | K1 |
| 1.2 | Understand the stack and queues data structures to solve problems. | K1 |
| **2** | **Skills:** | |
| 2.1 | Apply basic data structures in implementing simple applications. | S1 |
| 2.2 | Apply different data structures (binary tree, binary search tree, hash, graph etc.) to solve problems | S1 |
| 2.3 | Use different search and sort algorithms to analyze collection of data, and analyze algorithms using big-O notation | S1 |
| **3** | **Values:** | |

## C. Course Content

| No | List of Topics | Contact Hours |
|---|---|---|
| 1 | Introduction to Data Structures and understanding standard data structures. | 9 |
| 2 | Linked Lists | 9 |
| 3 | Stacks and Queues | 12 |
| 4 | Trees | 12 |
| 5 | Algorithm Analysis | 6 |
| ..6. | Searching and sorting Algorithms Analysis | 9 |
| 7 | Hash Tables | 9 |
| 8 | Graph | 9 |
| **Total** | | **75** |

## D. Teaching and Assessment

### 1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

| Code | Course Learning Outcomes | Teaching Strategies | Assessment Methods |
|---|---|---|---|
| **1.0** | **Knowledge and Understanding** | | |
| | | | |
| **2.0** | **Skills** | | |
| 2.1 | Implement basic data structures in implementing simple applications. | Lectures Labs | **Direct Assessment Tool** Class Discussions /Quizzes / Homework/Project/ Exams **Indirect Assessment Tool** Course Exit Survey |
| 2.2 | Implement pointer and the linked list data structure to solve problems. | Lectures Labs | **Direct Assessment Tool** Class Discussions/Quizzes / Homework/Project/ |

| Code | Course Learning Outcomes | Teaching Strategies | Assessment Methods |
|------|--------------------------|---------------------|---------------------|
| | | | Exams<br>**Indirect Assessment Tool**<br>Course Exit Survey |
| 2.3 | Implement the stack and queues data structures to solve problems. | Lectures<br>Labs | **Direct Assessment Tool**<br>Class Discussions/Quizzes / Homework/Project/ Exams<br>**Indirect Assessment Tool**<br>Course Exit Survey |
| 2.4 | Implement and use different data structures (binary tree, binary search tree, hash, graph.) to solve problems | Lectures<br>Labs | **Direct Assessment Tool**<br>Class Discussions /Quizzes / Homework/Project/ Exams<br>**Indirect Assessment Tool**<br>Course Exit Survey |
| 2.5 | Use different search and sort algorithms to analyze collection of data, and analyze simple algorithms using big-O notation | Lectures<br>Labs | **Direct Assessment Tool**<br>Class Discussions /Quizzes / Homework/Project/ Exams<br>**Indirect Assessment Tool**<br>Course Exit Survey |
| **3.0** | **Values** | | |

## 2. Assessment Tasks for Students

| # | Assessment task* | Week Due | Percentage of Total Assessment Score |
|---|------------------|----------|--------------------------------------|
| 1 | Home Work / Students' Participation in class discussion-Attendance | Every Week | 15% |
| 2 | Quizzes | Week 4 & 9 | 10% |
| 3 | Mid-Term and Final lab Exam | Weeks 5 &11 | 15% |
| 4 | Mid-Term | Week 6 | 20% |
| 5 | Final Examination | Week 16 | 40% |

**\*Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

## E. Student Academic Counseling and Support

**Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :**
Academic advising and counseling of students is an important component of teaching; student academic advising is a mandatory requirement of College of Computers and Information Technology (CCIT). Appropriate student advising provides support needed for the student during

times of difficulty. In addition, it helps the student to build a close relationship with his/her advisor and to provide student motivation and involvement with the institution.

In addition, since faculty are usually the first to recognize that a student is having difficulty, faculty members play a key role in developing solutions for the students or referring them to appropriate services. Faculty members also participate in the formal student-mentoring program.

Additional counseling is provided by course directors, who provide students with academic reinforcement and assistance and refer "at risk" students to the Vice Dean for Academic Affairs and the Vice Dean for female section.

## F. Learning Resources and Facilities

### 1.Learning Resources

| | |
|---|---|
| **Required Textbooks** | *Text Book: Data Structures and Algorithm Analysis in C++ by **Mark Allen Weiss** *Lectures Slides |
| **Essential References Materials** | Algorithms and Data Structures by N. Wirth |
| **Electronic Materials** | NON |
| **Other Learning Materials** | NON |

### 2. Facilities Required

| Item | Resources |
|---|---|
| **Accommodation** (Classrooms, laboratories, demonstration rooms/labs, etc.) | ● A Lecture room appropriate for maximum 25 students with a personal computer, a data show and a smart board. <br> ● A Lab room appropriate for maximum 15 students with a personal computer, a data show and a smart board. |
| **Technology Resources** (AV, data show, Smart Board, software, etc.) | ● Lab materials and required software |
| **Other Resources** (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list) | |

## G. Course Quality Evaluation

| Evaluation Areas/Issues | Evaluators | Evaluation Methods |
|---|---|---|
| Effectiveness of Teaching | Students | Students' surveys and Student's course evaluation |

| Evaluation Areas/Issues | Evaluators | Evaluation Methods |
|---|---|---|
| Improvement of Teaching | Course Coordinator | deficiencies based on the student Evaluation, faculty input, course file, and program assessment |
| Verifying Standards of Student Achievement | Curriculum Committee | <ul><li>Review CAF (Course assessment file)</li><li>Alumni surveys.</li></ul> Periodic exchange and remarking of tests or a sample of assignments with staff at another |

**Evaluation areas** (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
**Evaluators** (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
**Assessment Methods** (Direct, Indirect)

## H. Specification Approval Data

| | |
|---|---|
| **Council / Committee** | |
| **Reference No.** | |
| **Date** | |

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