CS2303: DATA STRUCTURES FOR MEDIA

Effective Term
Semester A 2022/23

Part I Course Overview

Course Title
Data Structures for Media

Subject Code
CS - Computer Science
Course Number
2303

Academic Unit
Computer Science (CS)

College/School
College of Engineering (EG)

Course Duration
One Semester

Credit Units
3

Level
B1, B2, B3, B4 - Bachelor's Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
CS2313 Computer Programmingor equivalent

Precursors
Nil

Equivalent Courses
Nil

Exclusive Courses
Nil

Part II Course Details

Abstract

This course aims to introduce a number of data structures and the mathematical tools for analysing their performance. Data structures that are commonly used for media are emphasised.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Evaluate and choose the appropriate data structures to solve problems.			x	
2	Analyse and compare data structures.		x	x	
3	Create the design of games using suitably adapted data structures and apply specific data structures for media needs.				x

A1: Attitude
Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability
Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

A3: Accomplishments
Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

Teaching and Learning Activities (TLAs)

	TLAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lecture	Explain the key concepts about algorithms and data structures and abstract data types, e.g., program complexities, searching, indexing, sorting, and manipulating data.	1, 2, 3	3 hours/week
2	Tutorial	Work on hands-on exercises (e.g., practice questions and coding tasks) and labs related to the key concepts and method covered in lectures.	2, 3	8 hours/semester

3	Project	Students are required to do one project. The project is either an implementation of some complicated data structures taught in the course, or a study on an advanced data structure not covered in class. The students are also required to analyse the complexities of data structures and demonstrate their abilities to apply knowledge learned to solve new problems. The project should be documented in a project report.	2, 3	After class
4	Assignment	Students are required to solve more challenging problems which are about the key concepts and methods covered in the lecture. There will be 2 assignments in total, covering different key concepts covered in the course.	1, 2, 3	After class

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Project	2, 3	15	
2	Assignment	1, 2, 3	10	
3	Tutorial coding tasks	2, 3	20	
4	Quiz	1, 2	5	1 mid-term quiz

Continuous Assessment (%)

50

Examination (%)

50

Examination Duration (Hours)

2

Additional Information for ATs

For a student to pass the course, at least 30% of the maximum mark for the examination must be obtained.

Assessment Rubrics (AR)

Assessment Task
Project

Criterion
ABILITY to DESIGN attractive games using suitable data structures

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Assessment Task
Assignment

Criterion
ABILITY to solve basic problems related to different data structures covered in the lecture

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Assessment Task
Tutorial coding tasks

Criterion
ABILITY to write code to implement basic data structures covered in the lecture or solve related problems

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Assessment Task
Quiz

Criterion
ABILITY to solve problems for different basic data structure topics

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Assessment Task
Examination

Criterion
ABILITY to solve problems for different advanced and media related data structures

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)

Not even reaching marginal levels

Part III Other Information

Keyword Syllabus

Complexities of programs: notation, average and worst case analysis, complexities of common programming constructs; Linked lists; Trees; Game trees; Abstract data types: stacks, queues, heaps, disjoint sets; Hash tables; Representation of vectors and bitmaps; Quadtrees and Octrees; Geometric structures.

Syllabus

- Program complexities
  Asymptotic notations for program complexities. Complexities of common programming constructs, e.g., loops and recursive programs. Average and worst case analysis.
- Dynamic data structures
  Linked list. Trees: Binary tree, Binary search trees. Balanced search trees.
- Abstract data types
  Principles of abstract data types. Examples : stacks, queues, heaps.
- Hash tables
  Direct addressing. Hash functions. Collision resolution.
- Vectors and Bitmaps
  Representation of vector and bitmap data
- Quadtrees and Octrees
  Structures of Quadtrees and Octrees and their uses in handling 2D and 3D data
- Geometric structures
  Spatial layout and shape of geometric components and attributes; Connectivity of components

Reading List

Compulsory Readings

	Title
1	Nil

Additional Readings

	Title
1	Weiss M. (2013). Data Structures & Algorithm Analysis in C++. Addison Wesley, 4th edition.
2	Foley, van Dam, Feiner, Hughes (2013). Computer Graphics: Principles and Practice. Addison Wesley, 3rd edition.
3	http://site.ebrary.com/lib/cityu/detail.action?docID=10053633