

**City University of Hong Kong  
Course Syllabus**

**offered by Department of Computer Science  
with effect from Semester A 2017/18**

---

---

**Part I Course Overview**

**Course Title:** Data Structures for Media

**Course Code:** CS2303

**Course Duration:** One semester

**Credit Units:** 3 credits

**Level:** B2

Arts and Humanities

**Proposed Area:**  
*(for GE courses only)*

Study of Societies, Social and Business Organisations

Science and Technology

**Medium of Instruction:** English

**Medium of Assessment:** English

**Prerequisites:**  
*(Course Code and Title)* CS2313 Computer Programming  
or equivalent

**Precursors:**  
*(Course Code and Title)* Nil

**Equivalent Courses:**  
*(Course Code and Title)* Nil

**Exclusive Courses:**  
*(Course Code and Title)* Nil

## Part II Course Details

### 1. Abstract

(A 150-word description about the course)

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.

### 2. Course Intended Learning Outcomes (CILOs)

(CILOs state what the student is expected to be able to do at the end of the course according to a given standard of performance.)

No.	CILOs <sup>#</sup>	Weighting* (if applicable)	Discovery-enriched curriculum related learning outcomes (please tick where appropriate)		
			A1	A2	A3
1.	Evaluate and choose the appropriate data structures to solve problems.			✓	
2.	Analyse and compare data structures.		✓	✓	
3.	Create the design of games using suitably adapted data structures and apply specific data structures for media needs.				✓
		100%			

\* If weighting is assigned to CILOs, they should add up to 100%.

<sup>#</sup> Please specify the alignment of CILOs to the Gateway Education Programme Intended Learning outcomes (PILOs) in Section A of Annex.

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 self-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.

### 3. Teaching and Learning Activities (TLAs)

(TLAs designed to facilitate students' achievement of the CILOs.)

Teaching pattern:

Suggested lecture/tutorial/laboratory mix: 2 hrs. lecture; 1 hr. tutorial.

TLA	Brief Description	CILO No.			Hours/week (if applicable)
		1	2	3	
Journal	As a learning and knowledge sharing tool, students are required to keep a journal to record learning progress and summarize personalized Q&A, in particular to accumulate experiences on this CILO.	✓			
Project	Students are required to do two projects. The first one is a simple extension of the materials taught in class while the second one is either an implementation of some complicated data structures taught in class or a study on an advanced data structure not covered in class. Both projects require the students to do some analysis on data structures and also give the students an opportunity to demonstrate their abilities to apply knowledge learned to solve new problems. The project should be documented in a project report.		✓	✓	
Presentation	Students are required to present their second project in class. The teacher will provide some basic background information for the related presented topics. In this way, students who present can practice their abilities to explain things clearly while knowledge on different topics prepared by different groups can be shared.			✓	

### 4. Assessment Tasks/Activities (ATs)

(ATs are designed to assess how well the students achieve the CILOs.)

Assessment Tasks/Activities	CILO No.			Weighting*	Remarks
	1	2	3		
Continuous Assessment: <u>30%</u>					
Journal / Project		✓	✓	15%	
Quiz	✓	✓		15%	
Examination	✓	✓		70%	
Examination <sup>^</sup> : 70% (duration: 2 hours)					
* The weightings should add up to 100%.				100%	

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

## 5. Assessment Rubrics

(Grading of student achievements is based on student performance in assessment tasks/activities with the following rubrics.)

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. Journal / Project	ABILITY to DESIGN attractive games using suitable data structures	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Quiz	ABILITY to solve problems for different basic data structure topics	High	Significant	Moderate	Basic	Not even reaching marginal levels
3. Examination	ABILITY to solve problems for different advanced and media related data structures	High	Significant	Moderate	Basic	Not even reaching marginal levels

### Part III Other Information (more details can be provided separately in the teaching plan)

#### 1. Keyword Syllabus

*(An indication of the key topics of the course.)*

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

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

#### 2. Reading List

##### 2.1 Compulsory Readings

*(Compulsory readings can include books, book chapters, or journal/magazine articles. There are also collections of e-books, e-journals available from the CityU Library.)*

##### 2.2 Additional Readings

*(Additional references for students to learn to expand their knowledge about the subject.)*

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