H6DSA: Data Structures and Algorithms

Module Code:	H6DSA
Long Title	Data Structures and Algorithms APPROVED
Title	Data Structures and Algorithms
Module Level:	LEVEL 6
EQF Level:	5
EHEA Level:	Short Cycle
Credits:	10
Module Coordinator:	
Module Author:	Alex Courtney
Departments:	School of Computing
Specifications of the qualifications and experience required of staff	This module requires a lecturer holding a BSc degree or higher, in computing/computer science or cognate discipline.

Learning Outcomes

On successful completion of this module the learner will be able to:

#	Learning Outcome Description
LO1	Explain the theory, concepts, principles and methods of the basic and complex data structures, and various algorithms used in computer science
LO2	Use object-oriented techniques such as interfaces, inheritance, and generics to package abstract data types appropriately.
LO3	Use iterative and recursive techniques to design and implement sorting and searching algorithms
LO4	Demonstrate the use of good principles of algorithm design
LO5	Identify and apply data structures and algorithms to solve real-life problems making use of emerging technologies and programming languages
LO6	Conduct in depth algorithm analysis in terms of performance and time complexity and present the results

Dependencies

Module Recommendations

No recommendations listed

Co-requisite Modules

No Co-requisite modules listed

Entry requirements	Learners should have attained the knowledge, skills and competence gained from stage 1 of the BSc (Hons) in Computing.

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Module Content & Assessment

Indicative Content
Linear Data Structures ArrayLists, Single and Double Linked Lists, Stack, Queue and Priority Queue, Operations on linear structures, Implementing linear structures, Exemplification of linear data structures in real world scenarios
Non-Linear Structures - Trees General tree: Features and characteristics, . Binary trees: Exemplification of (Binary) Tree in real world scenarios, Tree organization and traversal, Tree search, Balancing a tree. Search Trees: Purpose and features of the search tree, Binary Search Tree, Building and Implementing a Binary Search Tree, Exemplification of Binary Search Tree in real world scenarios
Non-Linear Structures - Graphs Graph's characteristics and representation, Types of Graph: simple, directed, weighted, mixed, etc., Operations performed on graphs, Implementation of graphs using linear data structures
Recursion Recursive approach, Fibonacci sequence, Characteristics of recursive algorithms, Exemplification of recursion for solving real-life problems, Recursive sorting
Sorting Algorithms Algorithms: Algorithm design & development , Algorithm's features, Experimental based algorithm's performance estimation, Time complexity: Big O Notation . Sorting Algorithms : Bubble sort, Insertion sort , Mergesort, Quicksort.
Searching algorithms Sequential (linear) search, Binary search.
Graph algorithms Graph search methods, Dijkstra's Algorithm.

Assessment Breakdown	%
Coursework	50.00%
End of Module Assessment	50.00%

Assessments

Full Time

Coursework

Assessment Type:	Formative Assessment	**% of total:**	Non-Marked
Assessment Date:	n/a	**Outcome addressed:**	2,3,4,5,6
Non-Marked:	Yes		

Assessment Description:
Lab exercises that involve the use of various data structures and algorithms.Feedback will be provided in oral format, or on-line through Moodle.

Assessment Type:	Continuous Assessment	**% of total:**	50
Assessment Date:	n/a	**Outcome addressed:**	2,3,4,5
Non-Marked:	No		

Assessment Description:
The assessment will consist of practical tasks in the form of an in-class tests that will assess learners' knowledge and competences on data structures and algorithms. Feedback will be provided in oral format, or on-line through Moodle.

End of Module Assessment

Assessment Type:	Terminal Exam	**% of total:**	50
Assessment Date:	End-of-Semester	**Outcome addressed:**	1,6
Non-Marked:	No		

Assessment Description:
Terminal assessment exam taken over 2 hours consists of one mandatory question and two questions of which the student must answer one that assess students' understanding of the underlying theories and concepts.

No Workplace Assessment

Reassessment Requirement

Repeat examination
Reassessment of this module will consist of a repeat examination. It is possible that there will also be a requirement to be reassessed in a coursework element.

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Repeat examination Reassessment of this module will consist of a repeat examination. It is possible that there will also be a requirement to be reassessed in a coursework element. The repeat exam will assess all learning outcomes.

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Module Workload

Module Target Workload Hours 0 Hours

Workload: Full Time

Workload Type	*Workload Description*	*Hours*	*Frequency*	*Average Weekly Learner Workload*
Lecture	Classroom & Demonstrations (hours)	24	Every Week	24.00
Tutorial	Other hours (Practical/Tutorial)	48	Every Week	48.00
Independent Learning	Independent learning (hours)	178	Every Week	178.00
			Total Weekly Contact Hours	72.00

Module Resources

Recommended Book Resources

Daniel Liang, Y.. (2017), , Introduction to Java Programming and Data Structures, Comprehensive Version, Global Edition, Pearson Education Limited.

Goodrich, M.T. and Tamassia, R ,. (2014), ,Data Structures and Algorithms in Java ,6th ,John Willey A Sons.

This module does not have any article/paper resources

This module does not have any other resources

Discussion Note:	