

Assessment Brief - Coursework

Academic Year	2025
Semester	3 [Jan Intake]
Module Number	CM1602
Module Title	Data Structures and Algorithms for Artificial Intelligence
Assessment Method	Coursework - Individual
Deadline (time and date)	28th July 2025 5PM (SLST)
Submission	Assessment Dropboxes in the Module Study Area in CampusMoodle.
Word Limit	1500
Use of Generative Artificial Intelligence (AI) text	IS NOT authorised
Module Co-ordinator	Malsha Fernando

What knowledge and/or skills will I develop by undertaking the assessment?

The content covered in the module includes below and you are expected to incorporate some/all below in order to produce a suitable solution.

1. Algorithmic Thinking: Understanding the concept of algorithms and their role in solving computational problems and developing algorithmic thinking to break down problems into step-by-step instructions.
2. Algorithm Analysis: Learning asymptotic analysis to evaluate algorithm efficiency as input size grows and understanding upper, lower, and average boundary analyses to assess algorithm performance with exploring best-case, worst-case, and average-case scenarios in algorithm analysis.
3. Order of Growth Classifications: Familiarity with different order of growth classifications such as constant, logarithmic, linear, linearithmic, quadratic, cubic, and exponential.
4. Sorting and Searching Algorithms: Implementing and analysing basic sorting algorithms (e.g., bubble sort, insertion sort, merge sort) and applying searching algorithms (e.g., binary search).

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<p>5. Graph Algorithms: Introduction to fundamental graph algorithms like depth-first search (DFS) and breadth-first search (BFS) with the basic understanding of graph traversal and its applications.</p> <p>6. Data Structures: Knowledge of common data structures like arrays, linked lists, stacks, queues, trees, maps, sets, and lists. Understanding the strengths and weaknesses of each data structure in different scenarios.</p> <p>7. Problem Solving with Algorithms: Developing problem-solving skills by applying algorithms and data structures to solve real-world problems and gaining the ability to choose the most appropriate algorithm or data structure for a given problem.</p>	

On successful completion of the assessment students will be able to achieve the following

Learning Outcomes:

1. **Describe** the fundamental concepts of algorithms and data structures.
2. **Evaluate** algorithms and data structures using the theory of complexity analysis (for performance).
3. **Apply** appropriate data structures given real-world problem to meet requirements of programming language API's.
4. **Adapt and extend** algorithms to real-world problems and address implementation requirements.

Please also refer to the Module Descriptor, available from the module Moodle study area.

What is expected of me in this assessment?

Task(s) - content

Case Study: "HealthSense" - Disease Outbreak Analysis System

Overview:

You're hired as a data engineer intern by "HealthSense," a health analytics startup. They want you to build a prototype analytics system (CLI) to help epidemiologists monitor, sort, search, and analyze outbreak data from multiple hospitals and regions. Your system must process time-series records of patient counts, identify hotspots, and allow queries for diagnosis frequency, trend sorting, and forecasting based on structured data. The total duration of the project is around 5-6 weeks.

Task Breakdown:

1. Problem Understanding and Custom Data Structure Selection:
 - a) Understand the case study requirements
 - b) Design data structures to hold:
 - a) Hospital-wise patient data using **Array/LinkedList**
 - b) Dynamic disease record list per hospital using **custom LinkedList**
 - c) Temporary analysis **Stack**
 - d) Priority handling using **Queue**
2. Data Inputs and Basic Sorting
 - a) Simulate reading data (String format)
 - b) Allow sorting disease counts per hospital using a suitable sorting algorithm
3. Search Functionality allowing user to search by:
 - a) Disease name
 - b) Hospital with specific patient count
4. Undo function and Process outbreak reports
 - a) Undo feature : Operations can be undone (keep last 3 operations)
 - b) Process outbreak reports in FIFO order per region
5. Trend Analysis
 - a) Implement Merge Sort to sort disease case counts over time (weekly trends)

What is expected of me in this assessment?

- b) Merge sorted data across hospitals to find peak periods
- 6. Binary Tree for Classification
 - a) Build a Binary Search Tree (BST) to classify disease outbreaks by severity
 - e.g., <20 mild, 21–50 moderate, >50 severe
 - b) Allow in-order, pre-order, post-order traversal
- 7. Mini Reporting Console
 - a) Build a CLI or text-based menu:
 - I. Add/search/sort data
 - II. Undo recent sort
 - III. View queue
 - IV. View BST analysis
- 8. Testing, Optimization, and Documentation
 - a) Write test cases for all custom data structures
 - b) Document your code
 - c) Add basic time complexity notes
 - d) Submit a PDF report with:
 - I. Overview of the system
 - II. How each DSA concept was used
 - III. Sample outputs

The use of in-built classes (e.g. Stack, Queue, LinkedList, etc.) in Java is highly discouraged as the expectation is to gain the knowledge, skill and ability to build customized data structures and algorithms to solve a real-world problem.

What is expected of me in this assessment?

Task(s) – format

1. You must provide a **single Java Application** in compressed format (.zip) for the above scenario with a **single Report** (.pdf) comprising the algorithm and data structure selection justifications and testing.
2. The application must include all project folders/packages/ files required to successfully execute the application on any desktop device using Java.
3. The report must include the following chapters.
 - a) Introduction
 - b) Algorithm/s selection justification
 - c) Data Structure/s selection justification
 - d) Test plans
 - e) References

Task(s) – Submission and Viva-voce examination

1. Make sure to **submit by the due date**.
2. **Two separate Dropboxes** will be available on CampusMoodle, i.e. for Application and for Report.
3. The submission must be **titled using ONLY the RGU ID**.
4. An individual demonstration/presentation of the coursework followed by a **physical viva-voce examination** will be conducted one week following the submission.
5. The schedule for viva will be posted on CampusMoodle after the submission deadline.
6. Participation for the viva voce is mandatory. Failing to appear will result in a NS grade for the coursework component.

How will I be graded?

A number of subgrades will be provided for each criterion on the feedback grid which is specific to the assessment.

The overall grade for the assessment will be calculated using the algorithm below*.

A	At least 50% of the subgrades to be at Grade A, at least 80% of the subgrades to be at Grade B or better, and normally 100% of the subgrades to be at Grade C or better.
B	At least 50% of the subgrades to be at Grade B or better, at least 80% of the subgrades to be at Grade C or better, and normally 100% of the subgrades to be at Grade D or better.
C	At least 50% of the subgrades to be at Grade C or better, and at least 80% of the subgrades to be at Grade D or better.
D	At least 50% of the subgrades to be at Grade D or better, and at least 80% of the subgrades to be at Grade E or better.
E	At least 50% of the subgrades to be at Grade E or better.
F	Failing to achieve at least 50% of the subgrades to be at Grade E or better.
NS	Non-submission.

*If the word count is above the specified word limit by more than 10% or the submission contains an excessive use of text within tables, the grade for the submission will be reduced to the next lowest grade.

Feedback grid

Will be shared soon

Coursework received late, without valid reason, will be regarded as a non-submission (NS) and one of your assessment opportunities will be lost.

What else is important to my assessment?

What is the Assessment Word Limit Statement?

It is important that you adhere to the Word Limit specified above. The Assessment Word Limit Statement can be found in Appendix 2 of the [RGU Assessment Policy](#). It provides detail on the purpose, setting and implementation of wordage limits; lists what is included and excluded from the word count; and the penalty for exceeding the word count.

What's included in the word count?

The table below lists the constituent parts which are included and excluded from the word limit of a Coursework; more detail can be found in the full Assessment Word Limit Statement. Images will not be allowed as a mechanism to circumvent the word count.

Excluded	Included
Cover or Title Page	Main Text e.g. Introduction, Literature Review, Methodology, Results, Discussion, Analysis, Conclusions, and Recommendations
Executive Summary (Reports) or Abstract	Headings and subheadings
Contents Page	In-text citations
List of Abbreviations and/or List of Acronyms	Footnotes (relating to in-text footnote numbers)
List of Tables and/or List of Figures	Quotes and quotations written within “...”
Tables – mainly numeric content	Tables – mainly text content
Figures	
Reference List and/or Bibliography	
Appendices	
Glossary	

What are the penalties?

The grade for the submission will be reduced to the next lowest grade if:

- The word count of submitted work is above the specified word limit by more than 10%.
- The submission contains an excessive use of text within Tables or Footnotes.

What else is important to my assessment?

What is plagiarism?

Plagiarism is “the practice of presenting the thoughts, writings or other output of another or others as original, without acknowledgement of their source(s) at the point of their use in the student’s work. All materials including text, data, diagrams or other illustrations used to support a piece of work, whether from a printed publication or from electronic media, should be appropriately identified and referenced and should not normally be copied directly unless as an acknowledged quotation. Text, opinions or ideas translated into the words of the individual student should in all cases acknowledge the original source” ([RGU 2022](#)).

What is collusion?

“Collusion is defined as two or more people working together with the intention of deceiving another. Within the academic environment this can occur when students work with others on an assignment, or part of an assignment, that is intended to be completed separately” ([RGU 2022](#)).

For further information please see [Academic Integrity](#).

What if I'm unable to submit?

- The University operates a [Fit to Sit Policy](#) which means that if you undertake an assessment then you are declaring yourself well enough to do so.
- If you require an extension, you should complete and submit a [Coursework Extension Form](#). This form is available on the RGU [Student and Applicant Forms](#) page.
- Further support is available from your Course Leader.

What additional support is available?

- [RGU Study Skills](#) provide advice and guidance on academic writing, study skills, maths and statistics and basic IT.
- [RGU Library guidance on referencing and citing](#).
- [The Inclusion Centre: Disability & Dyslexia](#).
- Your Module Coordinator, Course Leader and designated Personal Tutor can also provide support.

What are the University rules on assessment?

The University Regulation '[A4: Assessment and Recommendations of Assessment Boards](#)' sets out important information about assessment and how it is conducted across the University.