ROBERT GORDON UNIVERSITY ABERDEEN

Assessment Brief - Coursework

Academic Year	**2024/25**
Semester	**1**
Module Number	**CM2607**
Module Title	**Advanced Mathematics for Data Science**
Assessment Method	**Coursework (consist of two parts)** **Part 01: Individual Assignment with Viva** **Part 02: ICT**
Deadline (time and date)	**Part 01: 15th Dec 2024, 11:59 p.m. (IST)** **Part 02: End of the Semester**
Submission	**Part 01: Assessment Dropbox in the Module Study Area in Campus Moodle.** **Part 02: Closed book written examination**
Word Limit	**N/A**
Use of Generative Artificial Intelligence (AI) text	**IS NOT authorised**
Module Co-ordinator	**Prashan Rathnayaka.**

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

Differentiation: Single variable functions, Differentiation, Definitions only for basic functions, rules and properties, Composition of functions and partial derivatives, Higher order derivatives. Integration: Definition and Rules with properties, partial fractions and definite and indefinite integrations Application: Finding area under the curves. Sequences and Series: Definition and examples of sequences, Series and the sequence of terms of a series, Arithmetic progressions, Geometric progressions, The sum to infinity of a series and the convergence and divergence of series. Discrete Cosine transform and Fourier transform family.

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

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

Part 02:

L01: Practice advanced mathematical ideas clearly in written form and place them within the context of their history and applications to Artificial Intelligence (AI) and Data Science (DS).

LO2: Use differentiation and integration equations to solve problems in AI and DS.

LO3: Use theories of sequences and series to identify bounded functions.

Part 01:

LO4: Convert mathematical functions into programmable code

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

What is expected of me in this CW Part 01: Individual Assignment with Viva?

Task(s) – content

Click here to download the CW Part 01

Task(s) - format

- Answer all questions.
- CW Part 01 carries 40% weighting for CW
- You may use python with any libraries that you like to answer these questions.
- **The CW Part 01 should be written using a Python notebook and submitted in the .ipynb file format.**
- There will be an in-person individual viva after the submission date.

What is expected of me in this CW Part 02: Examination?

Structure and content

- This will be an examination paper consisting of 04 questions as follows:
  - Question 01: Covering Chapter 01 and 02
  - Question 02: Covering Chapter 03 and 04

What is expected of me in this CW Part 02: Examination?
○ Question 03: Covering Chapter 05 ○ Question 04: Covering Chapter 06 • Duration - Two (02) hours • You must answer all questions. • This paper carries 60% weighting for CW.
Procedure • Students need to come to IIT. • The registry will inform them of the date, time, and venue. • This is a **closed book written examination**, and they should answer the questions in the booklet provided. • Students may make use of a **non-programmable calculator**. • Please note that a **formula sheet** will be provided on the last page of the question paper. It is also available for early reference in the Moodle under the "**Assessment Brief**" section.

How will I be graded? CW Part 01: Individual Assignment with Viva	
A number of subgrades will be provided for each criterion on the feedback grid which is specific to the assessment.	
A	At least 50% of the subgrades to be at Grade A, at least 75% 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 75% 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 75% 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 75% 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.

How will I be graded? CW Part 01: Individual Assignment with Viva	
NS	Non-submission.

How will I be graded? CW Part 01: CW Part 02: Examination	
• **The examination will be graded based on the mark's breakdown provided in the question paper.**	
A	Total Marks ≥ 80%
B	80% > Total Marks ≥ 65%
C	65% > Total Marks ≥ 45%
D	45% > Total Marks ≥ 35%
E	45% > Total Marks ≥ 35%
F	35% > Total Marks
NS	Non-submission.

The overall grade for the module will be calculated using the algorithm below

		CW Part 01 (40% Weighting)						
		A	B	C	D	E	F	NS
CW Part 02 (60% Weighting)	A	A	A	B	B	C	E	NS
	B	B	B	B	C	C	E	NS
	C	B	C	C	C	D	E	NS
	D	C	C	D	D	D	E	NS
	E	C	D	D	E	E	E	NS
	F	E	E	E	E	F	F	NS
	NS	NS	NS	NS	NS	NS	NS	NS

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Feedback grid

GRADE	A	B	C	D	E	F
DEFINITION / CRITERIA (WEIGHTING)	**EXCELLENT** Outstanding Performance	**COMMENDABLE/VERY GOOD** Meritorious Performance	**GOOD** Highly Competent Performance	**SATISFACTORY** Competent Performance	**BORDERLINE FAIL**	**UNSATISFACTORY** Fail
Question 1 **(Weight 01)**	Demonstrates an in-depth understanding of partial derivatives and their application in AI model optimization. All subparts (a to d) are correctly answered with clear, well-organized solutions. The Python function is highly efficient and properly documented, demonstrating excellent coding practices. The 3D surface plot is accurately produced with appropriate labels, colors, and a clear range. Viva: Provides comprehensive and articulate responses, demonstrating mastery in explaining the significance of gradient vectors in model optimization.	Shows a solid grasp of partial derivatives and their application in model optimization, with minor errors. Most subparts are answered correctly, with sufficient detail. The Python function works correctly but may have minor inefficiencies or missing comments. The 3D surface plot is mostly accurate but may lack some labels or clarity. Viva: Responds confidently with good understanding, but may miss some minor details or explanations.	Demonstrates an adequate understanding with some errors or omissions. Solutions to subparts are mostly correct, but explanations may be less clear or detailed. The Python function runs but may be inefficient or lack clarity in documentation. The 3D plot is present but may have noticeable errors or missing elements. Viva: Provides basic explanations but lacks depth in understanding or connection to broader applications.	Shows basic understanding with noticeable errors or omissions in solutions. Some subparts are answered, but there is a lack of clarity and detail. The Python function is inefficient or poorly documented. The plot may be incorrect or missing key features. Viva: Provides limited answers, demonstrating surface-level understanding without in-depth explanations.	Limited understanding with major errors or incomplete responses in solutions. Few subparts answered correctly; explanations are minimal or unclear. Python function is poorly written or does not run correctly. Plot is missing or incorrect. Viva: Struggles to articulate concepts, providing minimal or inaccurate answers.	Shows minimal or no understanding of the topic; solutions are incorrect or missing. Python function is missing or incorrect, and the plot is absent or irrelevant. Viva: Fails to provide coherent answers, showing no understanding of the question's core concepts.
Question 2 **(Weight 01)**	Fully understands integration and its application in signal processing. Computes the integral correctly using SymPy and clearly explains the process. Provides a well-annotated plot, accurately representing the function and area under the curve.	Shows a good understanding of integration in signal processing, with minor errors. Correctly computes the integral but may miss minor details in the explanation. Plot is mostly accurate, with minor annotation issues. Provides a good interpretation of the integral but lacks depth in the context explanation.	Adequate understanding of integration concepts with noticeable errors or omissions. Correctly computes the integral, but the explanation or code may lack clarity. Plot is correct but may lack sufficient labeling or details. Interpretation is present but basic and not fully connected to the context.	Basic understanding with several errors or omissions in the integration process. Computes the integral with significant inaccuracies. Plot is minimally labeled or lacks clarity. Interpretation is limited or incomplete. Viva: Struggles to connect concepts with the practical application of integration.	Shows limited understanding, with mostly incorrect computation and explanations. Plot is incorrect or missing, and interpretation is inadequate. Viva: Unable to clearly articulate the relevance of integration to signal processing.	No understanding demonstrated; integral computation and plot are missing or incorrect. Viva: Fails to provide any meaningful response, showing no understanding of integration in this context.

GRADE	A	B	C	D	E	F
DEFINITION / CRITERIA (WEIGHTING)	**EXCELLENT** Outstanding Performance	**COMMENDABLE/VERY GOOD** Meritorious Performance	**GOOD** Highly Competent Performance	**SATISFACTORY** Competent Performance	**BORDERLINE FAIL**	**UNSATISFACTORY** Fail
	Offers an insightful interpretation of the integral in the context of signal energy. Viva: Demonstrates thorough understanding and confidently articulates the significance of integration in signal processing.	Viva: Provides clear and confident answers but may miss some minor aspects.	Viva: Provides basic responses, showing limited connection between integration and signal processing applications.			
Question 3 **(Weight 01)**	Demonstrates a deep understanding of series approximation and convergence. Python script is efficiently written, accurately approximates ln(1 + x), and is well-commented. Plots are clear, well-labeled, and effectively compare the approximation and actual function. Provides a comprehensive analysis of convergence behavior and errors. Viva: Explains concepts clearly and thoroughly, showcasing advanced knowledge of numerical approximation.	Good understanding with minor errors in series approximation and convergence. Python script is correct but could be more optimized or better documented. Plots are mostly accurate, with minor labeling or clarity issues. Provides a reasonable analysis of convergence behavior. Viva: Provides good answers with minor gaps in explanation or details.	Adequate understanding, with some noticeable errors in approximation or analysis. Python script works but may lack efficiency or clarity. Plots are present but may have noticeable errors or lack detail. Analysis is basic, with limited depth. Viva: Provides basic explanations, demonstrating limited understanding of convergence.	Shows basic understanding, with several errors in approximation or analysis. Python script is inefficient or poorly documented. Plots are minimal or incorrect. Analysis is superficial or lacks relevance. Viva: Struggles to explain series approximation concepts adequately.	Limited understanding with mostly incorrect approximations and explanations. Python script is mostly incorrect or missing. Plots are missing or incorrect. Viva: Fails to provide coherent answers regarding series convergence.	No understanding demonstrated; script and plots are missing or irrelevant. Viva: Unable to articulate any understanding of series approximation or convergence.
Question 4 **(Weight 01)**	Fully understands Fourier Transform and its application in data filtering. Python code is efficient, well-documented, and accurately performs Fourier Transform and filtering. Frequency spectrum and filtered signal plots are accurate and well-annotated. Provides insightful discussion on the impact of filtering and real-world applications.	Good understanding of Fourier Transform, with minor errors or omissions. Code is mostly efficient but could be better optimized or commented. Plots are accurate but may lack some labels or clarity. Discussion is clear but lacks depth in some areas. Viva: Confident answers with minor gaps in understanding.	Adequate understanding with some errors in code or explanations. Code works but may be inefficient or lack clarity. Plots are present but may have noticeable errors or lack detail. Discussion is basic and not fully developed. Viva: Provides basic explanations, showing limited understanding of filtering applications.	Basic understanding, with significant errors in code or explanations. Plots are minimal or incorrect. Discussion is superficial or lacks relevance. Viva: Struggles to explain Fourier Transform concepts adequately.	Limited understanding with mostly incorrect code and explanations. Plots are missing or incorrect. Viva: Fails to provide coherent answers regarding Fourier Transform.	No understanding demonstrated; code and plots are missing or irrelevant. Viva: Unable to articulate any understanding of Fourier Transform or filtering.

GRADE	A	B	C	D	E	F
DEFINITION / CRITERIA (WEIGHTING)	**EXCELLENT** Outstanding Performance	**COMMENDABLE/VERY GOOD** Meritorious Performance	**GOOD** Highly Competent Performance	**SATISFACTORY** Competent Performance	**BORDERLINE FAIL**	**UNSATISFACTORY** Fail
	Viva: Demonstrates mastery in explaining Fourier Transform concepts and data filtering applications.					
Question 5 **(Weight 01)**	Thorough understanding of image processing concepts using Fourier and DCT. All tasks (a to d) are completed with accurate, well-documented code. Visual comparisons are clear, detailed, and effectively demonstrate the concepts. Provides insightful explanations of artifacts and their occurrence. Viva: Demonstrates mastery in explaining image processing techniques and their applications.	Good understanding of image processing, with minor errors in code or visualizations. Code is mostly correct but could be better optimized or commented. Visualizations are accurate but may lack some detail or clarity. Explanations are clear but may lack depth in some areas. Viva: Confident answers with minor gaps in understanding.	Adequate understanding with some errors in code or visual explanations. Code works but may lack efficiency or clarity. Visualizations are present but may have noticeable errors or lack detail. Explanations are basic and not fully developed. Viva: Provides basic explanations, showing limited understanding of image processing.	Basic understanding, with significant errors in code or visual explanations. Visualizations are minimal or incorrect. Explanations are superficial or lack relevance	Limited understanding with mostly incorrect code and explanations. Visualizations are missing or incorrect. Viva: Fails to provide coherent answers regarding image processing techniques.	No understanding demonstrated; code and visualizations are missing or irrelevant. Viva: Unable to articulate any understanding of image processing concepts.

Coursework received late will be regarded as a non-submission (NS) and one of your assessment opportunities will be lost.

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What else is important to my CW?

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 CW?

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 if I'm unable to sit the exam?

- 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 are unable to sit the exam, you should submit a Deferral Request Form no later than five working days after the date of the exam. This form is available on the RGU Student and Applicant Forms page.
- Further support is available from your Course Leader.

What else is important to my CW?

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.

Can I use a dictionary?

- Permission to use a simple, paper-based translation dictionary will only be granted to students whose first language is not English. A Translation Dictionary Approval Form must be completed in order for a student to receive permission to use a translation dictionary in examinations.
- Guidance on the use of dictionaries in examinations can be found in the document Guidelines and guidance notes.

Can I use a calculator?

- Unless it is permitted by the School and stated on the examination paper that calculators are permitted, calculators may not be used.
- Guidance on the use of calculators in examinations can be found in the document Guidelines and guidance notes.