

[Course Title] Mathematics for Data Science

[Course Code] DSAA 2088

[No. of Credits] 3

[Any pre-/co-requisites] Linear Algebra, Applied Statistics, Machine Learning or Deep Learning or Data Mining

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Course Description

Topics covered in this course include analytic geometry, matrix decomposition, vector calculus, and probability and distributions, drawing from the resource provided at <https://mml-book.github.io/> (Mathematics for Machine Learning). Additionally, the course encompasses various subjects within discrete mathematics, such as logic and proofs, properties of relations, automata, etc. The course is specifically tailored for applications in computer science and is delivered through a lecture-based format.

Intended Learning Outcomes (ILOs)

By the end of this course, students should be able to:

1. Have a fundamental understanding of advanced mathematics knowledge, such as advanced linear algebra and advanced geometry.
2. Understand and evaluate advanced mathematical models for Data Science problems.
3. Analyze and critique the Data Science applications of the mathematics knowledge.
4. Design and select different mathematical tools to model data problems in application areas.
5. Communicate effectively to convey scientific knowledge.
6. Develop a broad interest in both mathematics and data science.

Assessment and Grading

This course will be assessed using criterion-referencing and grades will not be assigned using a curve. Detailed rubrics for each assignment are provided below, outlining the criteria used for evaluation.

Assessments:

Assessment Task	Contribution to Overall Course grade (%)	Due date
Homework	20%	TBD
Mid-Term test	40%	Oct. 20
Final examination	40%	TBD

Mapping of Course ILOs to Assessment Tasks

Assessed Task	Mapped ILOs	Explanation
Homework	ILO-1, ILO-2, ILO-3, ILO-4, ILO-5, ILO-6	These tasks are intended to evaluate students' abilities, comprehension, and commitment to learning (ILO 6), as well as their understanding and application of mathematical tools to model data-related problems (ILO-1, ILO-2, ILO-3, ILO-4, ILO5).
Mid-Term test	ILO-1, ILO-2, ILO-3, ILO-4, ILO-5	The mid-term exam will be utilized to evaluate students' understanding of advanced mathematical concepts and their ability to apply these concepts to model data-related problems (ILO-1, ILO-2, ILO-3, ILO-4, ILO5).
Final exam	ILO-1, ILO-2, ILO-3, ILO-4, ILO-5	The final exam will also be utilized to evaluate students' understanding of advanced mathematical concepts and their ability to apply these concepts to model data-related problems (ILO-1, ILO-2, ILO-3, ILO-4, ILO5).

Final Grade Descriptors:

Grades	Short Description	Elaboration on subject grading description
A	Excellent Performance	Exhibits a thorough understanding of the subject matter, showcasing expertise in problem-solving and a high degree of creativity in thinking. Demonstrates excellent performance in both conceptual understanding and computational tasks, with approaches and solutions to advanced mathematics knowledge that are completely, almost completely, or roughly completely correct.
B	Good Performance	Demonstrates a good knowledge and understanding of the main subject matter, along with competence in problem-solving and the ability to analyze and evaluate issues. Shows good performance in conceptual understanding of advanced mathematics knowledge, with good, satisfactory, or inadequate computational skills.

C	Satisfactory Performance	Exhibits adequate knowledge of core subject matter, demonstrates competence in addressing familiar problems, and shows some ability for analysis and critical thinking. Achieves satisfactory performance in conceptual understanding of advanced mathematics knowledge, with an adequate, weak, or inadequate level of computational skills.
D	Marginal Pass	Demonstrates threshold knowledge of core subject matter and basic problem-solving skills. Exhibits potential for further development in the discipline. Performance is marginal, indicating a lack of understanding and a low level of computational skills.
F	Fail	Exhibits insufficient understanding of the subject matter and lacks the necessary problem-solving skills. Shows limited capacity for critical or analytical thinking and demonstrates minimal effort in pursuing learning goals. Overall performance is unsatisfactory, with no evidence of understanding.

Course AI Policy

Students are encouraged to use generative artificial intelligence (GAI) tools for self-studying and exploring the topics of mathematics for data science.

However, students are not allowed to use GAI tools to complete assessment tasks in this course.

Communication and Feedback

Assessment marks for individual assessed tasks will be communicated via Canvas within two weeks of submission. Feedback on assignments will include, for instance, strength and weakness, suggestion for further thoughts, and areas for improvement. Students who have further questions about the feedback including marks should consult the instructor within five working days after the feedback is received.

Resubmission Policy

1-3 Days Late: 10% of the total possible points will be deducted from the score.

4-7 Days Late: 20% of the total possible points will be deducted.

More than 7 Days Late: The assignment will not be accepted and will receive a score of zero.

Extensions:

Extensions will only be granted in exceptional circumstances, such as documented medical emergencies or other serious situations. Students must contact the instructor as soon as possible to request an extension.

If there are technical difficulties with the submission platform, students must email the instructor immediately with evidence of the issue (such as screenshots) and submit the assignment as soon as the issue is resolved.

Required Texts and Materials

Mathematics for Machine Learning (<https://mml-book.github.io/>)

Discrete Mathematics with Applications, 5th Edition, Susanna S. Epp.

Academic Integrity

Students are expected to adhere to the university's academic integrity policy. Students are expected to uphold HKUST(GZ)'s Academic Honor Code and to maintain the highest standards of academic integrity. The University has zero tolerance of academic misconduct. Please refer to [Regulations for Academic Integrity and Student Conduct](#) for the University's definition of plagiarism and ways to avoid cheating and plagiarism.