

CAI3002 Mathematical Foundations for AI

COURSE INFORMATION

Prerequisites	Academic Year & Level		Teaching Methods			Credit Hrs.
	Year	Semester	Lecture	Tutorial	Laboratory	
EBA2203 & EBA2204	4	7/8	2	2	0	3

COURSE AIM

- To impart a strong foundation in mathematical concepts essential for AI and machine learning.
- To bridge the gap between theoretical mathematics and practical applications in computer science.
- To explore matrix methods, statistical models, and their roles in AI algorithms.
- To provide hands-on experience with numerical computing, linking mathematical theory with real-world AI applications.

COURSE WEEKLY CONTENTS

1	Introduction to Mathematics in AI: Role and Importance
2	Matrix Algebra: Basics and Applications in AI
3	Linear Equations and Systems in AI: Solving and Applications
4	Statistics and Probability in AI: Fundamental Concepts
5	Regression Analysis: Linear and Non-linear Models
6	Regularization Techniques in AI: Concepts and Case Studies
7	Mid-term Review Exam
8	Singular Value Decomposition (SVD) and Its Applications in AI
9	Iterative Optimization Algorithms in Machine Learning
10	LASSO and Support Vector Machines: A Mathematical Perspective
11	Clustering Algorithms and Kernel Methods: The Mathematical Framework
12	Project Presentations
13	Numerical Computing in AI: Using Tools like Matlab, Python, or R
14	Case Studies: Applying Mathematical Concepts in Real-world AI Solutions
15	Revision and Recap of Course Content

STUDENT GRADING & ASSESSMENT

Weeks	Exams	Assign.	Quizzes	Reports	Present.	Lab.	Total
1 to 7	←		30	MARKS		→	30
8 to 12	←		20	MARKS		→	20
1 to 15	←		10	MARKS		→	10
16 or 17	40	Final					40

REFERENCES

Textbook	"Mathematics for Machine Learning" by Marc Peter Deisenroth, A Aldo Faisal, and Cheng Soon Ong. This textbook offers an in-depth exploration of the essential mathematics behind machine learning concepts, making it an excellent resource for the course, which blends mathematical theory with practical AI applications.
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