

Lecture Plan		
Name of the College: Government College of Arts, Science and Commerce, Sanquelim-Goa		
Name of Faculty: Prajyot Maruti Patil	Subject: Mathematics	
Paper code: MAT-6403 Mathematics for Machine Learning (Pract)	Program: M.Sc.	Division: -
Academic year: 2026-27	Semester: IV	Total Lectures: 60
Course Objectives: 1. To introduce core mathematical foundations of Machine Learning — including linear algebra, calculus, probability, and optimization — fostering a rigorous understanding of their definitions, properties, and interconnections. 2. To develop the learner’s capacity to formulate and verify mathematical results and proofs that underpin algorithms and models in Machine Learning. 3. To train learners to identify, select, and apply appropriate mathematical techniques such as matrix factorizations, gradient-based optimization, and probabilistic reasoning to solve structured computational problems. 4. To encourage analytical reasoning, creativity, and mathematical precision in formulating, analyzing, and solving new or unfamiliar problems in Machine Learning		
Expected Course Outcome: 1) Demonstrate conceptual understanding and familiarity with the fundamental mathematical principles — including matrix decompositions, vector calculus, probability, and optimization — that form the basis of Machine Learning. 2) Construct and validate mathematical derivations and proofs for results such as decomposition properties, gradient identities, and optimization conditions relevant to Machine Learning. 3) Select, modify, and implement appropriate mathematical and computational methods — including SVD, backpropagation, optimization, and Bayesian inference — to solve structured problems. 4) Analyze and synthesize mathematical models and formulate precise arguments to solve unseen or ill-structured problems in Machine Learning contexts, demonstrating originality and logical rigor.		

Month	Lecture From	Lecture To	No. of Lectures	Topic / Subtopic to be Covered	ICT Tools	Reference Books
June	22/06/2026	27/06/2026	0	Introduction to Jupyter Notebook and Python for Mathematical Computing	Smart Board	Deisenroth, M. P., Faisal, A. A., & Ong, C. S.: Mathematics for Machine Learning (Cambridge University Press)
	29/06/2026	04/07/2026	4	SVD for Image Compression	Smart Board PDF	Deisenroth, M. P., Faisal, A. A., & Ong, C. S.: Mathematics for Machine Learning (Cambridge University Press)
July	06/07/2026	11/07/2026	4	Eigendecomposition	Smart Board PDF	Deisenroth, M. P., Faisal, A. A., & Ong, C. S.: Mathematics for Machine Learning (Cambridge University Press)
	13/07/2026	18/07/2026	4	Symbolic Gradients and Visualization	Smart Board	Deisenroth, M. P., Faisal, A. A., & Ong, C. S.: Mathematics for Machine Learning (Cambridge University Press)
	20/07/2026	25/07/2026	4	Backpropagation Simulation	Data Projector	Deisenroth, M. P., Faisal, A. A., & Ong, C. S.: Mathematics for Machine Learning (Cambridge University Press)
Jul / Aug	27/07/2026	01/08/2026	4	Numerical Differentiation and Visualization	Smart Board	Deisenroth, M. P., Faisal, A. A., & Ong, C. S.: Mathematics for Machine Learning (Cambridge University Press)
August	03/08/2026	08/08/2026	4	Sampling and Distribution Analysis	Smart Board PDF	Deisenroth, M. P., Faisal, A. A., & Ong, C. S.: Mathematics for Machine Learning (Cambridge University Press)
	10/08/2026	15/08/2026	4	Change of Variables	Smart Board	Deisenroth, M. P., Faisal, A. A., & Ong, C. S.: Mathematics for Machine Learning (Cambridge University Press)
	17/08/2026	22/08/2026	4	Bayesian Inference	Smart Board PDF	Deisenroth, M. P., Faisal, A. A., & Ong, C. S.: Mathematics for Machine Learning (Cambridge University Press)
	24/08/2026	29/08/2026	4	Gradient Descent Implementation	Smart Board PDF	Deisenroth, M. P., Faisal, A. A., & Ong, C. S.: Mathematics for Machine Learning (Cambridge University Press)
Aug / Sep	31/08/2026	05/09/2026	4	Constrained Optimization	Smart Board	Deisenroth, M. P., Faisal, A. A., & Ong, C. S.: Mathematics for Machine Learning (Cambridge University Press)

Sep	07/09/2026	12/09/2026	4	Comparative Estimation	Smart Board	Deisenroth, M. P., Faisal, A. A., & Ong, C. S.: Mathematics for Machine Learning (Cambridge University Press)
	14/09/2026	19/09/2026	—	GANESH CHATURTHI BREAK		
	21/09/2026	26/09/2026	4	Geometric and Bayesian View	Smart Board	Deisenroth, M. P., Faisal, A. A., & Ong, C. S.: Mathematics for Machine Learning (Cambridge University Press)
Sep / Oct	28/09/2026	03/10/2026	4	Revision	Smart Board	Deisenroth, M. P., Faisal, A. A., & Ong, C. S.: Mathematics for Machine Learning (Cambridge University Press)
Oct	05/10/2026	10/10/2026	4	Revision	Smart Board PDF	Deisenroth, M. P., Faisal, A. A., & Ong, C. S.: Mathematics for Machine Learning (Cambridge University Press)
	12/10/2026	14/10/2026	0		Smart Board	Deisenroth, M. P., Faisal, A. A., & Ong, C. S.: Mathematics for Machine Learning (Cambridge University Press)

*** Assessment Rubrics**

Component	Max Marks
ISA 1	10
ISA 2	10
Practical	Nil
Project	Nil
Semester End Exam	80