

Maharashtra State Board of Technical Education, Mumbai

LABORATORY PRACTICAL PLANNING

K2-A

Academic Year: 2025–2026

Academic Year: 2025-26

Date: 10/12/2025

Institute Name & Code: K. K. Wagh Polytechnic, Nashik-3 (0078)

Program & Code: Artificial Intelligence & Machine Learning (AN) **Course Code & Abbr.:** 313420 (MML)

Course Name: Mathematics for Machine Learning

Name of Faculty: Mr. S. V. Waghmare

Class: SYAN

Course Index: 404

Semester: IVth

Scheme: K

Total Hrs: 30

• Course Outcomes (COs):

By learning course Mathematics for Machine Learning (MML-313420) Second Year students will be able to:

- CO404.1 - Use partial differentiation concept to obtain optimal solution.
- CO404.2 – Implement matrix concept to solve real life problems
- CO404.3 - Build programs to implement basic operations based on vectors and tensors.
- CO404.4 - Evaluate numerical differentiation and integration functions.
- CO404.5 - Apply the linear programming problem concept to obtain optimal solution.

• Teaching-Learning and Assessment Scheme:

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Paper Duration	Assessment Scheme										Total Marks
				Actual Contact Hrs/Week			SLH	NLH			Theory				Based on LL Practical				Based on SL		
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
													Max	Max	Max	Min	Max	Min	Max	Min	
313420	Mathematics For Machine Learning	MML	AEC	4	-	2	-	6	3	3	30	70	100	40	25	10	25@	10	-	-	150

@ indicates Internal Practical Exam.

• Laboratory Learning Outcome (LLO)

- ✓ LLO 1.1 Find partial derivative of first order, second order and mixed order using Python programming.
- ✓ LLO 2.1 Find maximum and minimum value of the function for two variables using Python programming
- ✓ LLO 3.1 Find maximum and minimum value of the function for three variables using Python programming.
- ✓ LLO 4.1 Calculate the rank of a matrix by elementary transformation using Python programming.
- ✓ LLO 5.1 Calculate the inverse of a matrix by elementary transformation using Python programming.
- ✓ LLO 6.1 Solve system of linear equations using Python programming.
- ✓ LLO 9.1 Implement algebra of vectors using Python programming.
- ✓ LLO 10.1 Implement vectors operations using Python programming.
- ✓ LLO 11.1 Implement basic algebraic operations on tensors using Python programming.
- ✓ LLO 12.1 Find numerical differentiation for the given data using Python programming.
- ✓ LLO 14.1 Find numerical integration using Simpson's one third rule for the given data using Python programming.
- ✓ LLO 15.1 Find optimal solution of linear programming problems by applying simplex method using Python programming.

• Lab Plan:

Sr. No.	CO	LLO	Name of Practical	Planned Date	Performance Date	Remarks	Related Self Learning (if any)
1	CO1	1.1	Write a program to compute partial derivative.	A-31/12/2025 B-29/12/2025 C-30/12/2025			
2	CO1	2.1	* Write a program to find maximum and minimum value of the function for two variables.	A-17/12/2025 B-15/12/2025 C-16/12/2025			

3	CO1	3.1	Write a program to find maximum and minimum value of the function for three variables.	A-24/12/2025 B-22/12/2025 C-23/12/2025			
4.	CO2	4.1	Write a program to find a) Elementary row and column transformations using Python loops. b) Rank of a matrix.	A-07/01/2026 B-05/01/2026 C-06/01/2026			
5.	CO2	5.1	* Write a program to find inverse of a matrix by elementary transformation.	A-14/01/2026 B-12/01/2026 C-13/01/2026			
6.	CO2	6.1	* Write a program to solve system of linear equations.	A-21/01/2026 B-19/01/2026 C-20/01/2026			
7.	CO3	9.1	* Write a program to implement algebra of vectors like addition, subtraction and scalar multiplication.	A-28/01/2026 B-02/02/2026 C-27/01/2026			
8.	CO3	10.1	* Write a program to implement vectors operations like dot product, cross product and scalar triple product.	A-04/02/2026 B-09/02/2026 C-03/02/2026			
9.	CO3	11.1	Write a program to implement basic algebraic operations on tensors like addition, subtraction.	A-11/02/2026 B-16/02/2026 C-10/02/2026			
10.	CO4	12.1	* Write a program to evaluate numerical differentiation for the given data.	A-18/02/2026 B-23/02/2026 C-17/02/2026			
11.	CO4	14.1	* Write a program to evaluate numerical integration using Simpson's one third rule for the given data.	A-25/02/2026 B-02/03/2026 C-24/02/2026			
12.	CO5	15.1	* Write a program to implement simplex method for 2 equations in 2 variables.	A-04/03/2026 B-09/03/2026 C-10/03/2026			

●Practical wise LLO-CO Mapping:

Practical. No.	LLO	CO403.1	CO403.2	CO403.3	CO403.4	CO403.5
1	1.1	✓				
2	2.1	✓				
3	3.1	✓				
4	4.1		✓			
5	5.1		✓			
6	6.1		✓			
7	9.1			✓		
8	10.1			✓		
9	11.1			✓		
10	12.1				✓	
11	14.1				✓	
12	15.1					✓

• Rules for Formative Assessment:

• Formative Assessment Criteria:

Performance Indicators		Weightage
Process Related (15 Marks)		70%
1	Logic Formulation	10%
2	Debugging Ability	20%
3	Follow ethical practices	40%
Product Related (10 Marks)		30%
1	Expected output	10%
2	Timely Submission of report	10%
3	Answer to Sample questions:	10%
Total (25 Marks)		100%

- ✓ Formative assessment of each practical is based on Process related (15 marks) and Product related (10 marks) - Total out of 25 marks as per the assessment scheme prescribed by MSBTE
- ✓ Final Formative Assessment (F.A.) of 25 marks is calculated as follows:

$$FA\ Marks = ((Total\ obtained\ marks) * 25) / (25 * Total\ Number\ of\ practicals)$$

• Summative Assessment Criteria:

- ✓ Final assessment of 25 Marks for all practicals.
- ✓ A comprehensive Final Practical End Semester examination (SA-PR of 25 Marks) will be conducted by MSBTE at the end of semester. Examiner for this examination will be Internal examiner.
- ✓ Final assessment of 25 Marks for all practicals.
- ✓ Summative Assessment (SA-PR) for 25 Marks will be conducted by MSBTE after the completion of the term.
- ✓ The schedule of MSBTE Practical Examination will be display on Notice board prior to examination.

• SUGGESTED LEARNING MATERIALS / BOOKS

Sr.No	Author	Title	Publisher
1	Grewal B. S.	Higher Engineering Mathematics	Tata McGraw Hill Education, New Delhi, ISBN : 9789386173522
2	A. C. Shrivastava, P. K. Shrivastava	Engineering Mathematics	PHI Learning, New Delhi, ISBN:9788120342934
3	Mark Lutz	Learning Python	O'Reilly Publication ISBN-13: 9780672329784
4	H.K. Dass, Er. Rajnish Verma	Higher Engineering Mathematics	S. Chand Technical, ISBN: 9788121938907
5	K.Nageswara Rao, Shaikh Akbar	Python Programming	Scitech Publication(India) Pvt. Ltd. ISBN:9789385983450

• LEARNING WEBSITES & PORTALS

Sr. No	Link /Portal	Description
1	https://atozmath.com/default.aspx	Online Learning Initiative for Mathematics Problems with Solutions
2	https://www.w3schools.com/ai/ai_mathematics.asp	Machine Learning Mathematics
3	https://www.geeksforgeeks.org/machine-learning-mathematics/	Machine Learning Mathematics
4	https://docs.python.org/3/tutorial/index.html	The Python Tutorial
5	https://onlinecourses.nptel.ac.in/noc21_ma38/preview	NPTEL Course
6	https://www.purplemath.com/index.htm	Foundational Mathematics to improve learning
7	https://mathworld.wolfram.com/	Extensive mathematical resource with detailed explanations
8	https://www.khanacademy.org/math	Mathematical concepts through video lectures

• **Tools for conducting Practicals:**

1. Python Interpreter/ IDE like colab.google.
2. Google classroom
3. YouTube
4. MKCL LMS-Learn Live

Mr. S V Waghmare
Faculty

Mrs. R. Y. Thombare
(HOD-AN)

CC: 1. Lab File 2. Course File-MML 3. Notice Board-AN Lab-03 4. Formative Assessment