Maharashtra State Board of Technical Education, Mumbai

LABORATORY PLAN (LP)

K-2

Academic Year: 2026–2027

Institute Name & Code: K. K. Wagh Polytechnic, Nashik (0078) **Date: 30/06/2026**
Programme and Code: Artificial intelligence and Machine Learning (AIML) **Course Index:** 304
Course Name: Statistical Modelling for Machine Learning C**ourse Abbr.-Code**: SML-313307
Semester: 3rd **Scheme**: 'K' **Allocated Hrs: 60** **Name of Faculty**: Mrs.P.A.Kadam/ Ms.D.N.More
Class: SYAN-Neural

- **Course Outcomes (COs):**

By learning course Statistical Modelling for Machine Learning (SML-313307) Second Year students Will be able to:

CO304.1: Solve the given problem based on Statistic Techniques using R-Programming.
CO304.2: Implement Statistic methods using R-Programming.
CO304.3: Use Principles of Probability to solve a given Problem.
CO304.4: Implement appropriate methods based on the Interpolation.
CO304.5: Apply Sampling Methods to solve given problems using R-Programming.

- **Teaching and Examination Scheme:**

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Assessment Scheme											
				Actual Contact Hrs./Week			SLH	NLH		Paper Duration	Theory				Based on LL & TL				Based on SL		Total Marks
															Practical						
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
											Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
313307	STATISTICAL MODELLING FOR MACHINE LEARNING	SML	DSC	3	1	4	2	10	5	3	30	70	100	40	25	10	50@	20	25	10	200

Abbreviations: CL- Class Room Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH- Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, SLA - Self Learning Assessment Legends: @ Internal Assessment

- **Laboratory Learning Outcome (LLO)**

LLO 1.1 Download and Install R studio and R Packages.
LLO 2.1 Implement basic mathematical operations in R programming.
LLO 3.1 Perform given operation on Datasets using R programming.
LLO 4.1 Find lowest and highest values and index position of max and min value from dataset using R Program.
LLO 5.1 Calculate Measures of Central tendency including Quartiles using R Program.
LLO 5.2 Calculate Deciles and Percentiles using R Program.
LLO 6.1 Create Frequency Distribution table using R Programming.
LLO 7.1 Calculate measures of Dispersion using R Program.
LLO 8.1 Draw Histogram and Ogive Curve to graphically represent Mode and Median for the given data.
LLO 9.1 Calculate Skewness for the given data using R Program.
LLO 10.1 Draw a scatterplot for the given data using R Program.

LLO 11.1 Perform the correlation test to evaluate the association between two or more variables using R Program.
LLO 12.1 Perform the correlation test to evaluate the association between two or more variables using R Program.
LLO 13.1 Find the Line of Regression for two variables using R Program.
LLO 14.1 Implement Classical Probability using R Program.
LLO 15.1 Implement Classical Probability using R Program.
LLO 16.1 Compute probability using R Program.
LLO 17.1 Calculate the conditional probability using R Program.
LLO 18.1 Calculate the probability of an event based on given information using R Program.
LLO 19.1 Find forward Interpolation using R Program.
LLO 20.1 Find backward Interpolation using R Program.
LLO 21.1 Find Extrapolation using R Program.
LLO 22.1 Generate Samples for the given dataset using R Program.
LLO 23.1 Perform the given type of sampling using R program.
LLO 24.1 Generate Sampling Distribution proportion using R program.
LLO 25.1 Perform Hypothesis Testing by t-Distribution using R program.
LLO 26.1 Perform Hypothesis Testing by Chi-Square Distribution using R program.

- **Laboratory Plan:**

Sr. No.	CO	LLO	Name of Practical	Planned Date		Actual Date	Remark/ Assessment Date with Staff sign
				From	To		
1.	CO304.1	1.1	Download R Studio. Install and configure R studio and R Packages.	A:03/07/2026 B:01/07/2026 C:06/07/2026	A:04/07/2026 B:04/07/2026 C:07/07/2026		
2.	CO304.1	2.1	Write Program to- a. Demonstrate the use of R-Numbers. (numeric, integer, complex). b. Convert number from one type to other using functions. c. Perform following operations. i. Addition and Subtraction on numbers. ii. Find Square root using of number using built-in function.	A:04/07/2026 B:04/07/2026 C:07/07/2026	A:10/07/2026 B:08/07/2026 C:13/07/2026		
3.	CO304.1	3.1	Write Program to- a. Print any built-in data set of R. b. Get information about the data set.c. Find the dimensions of the data set and view the names of the variables. Hint: Use dim( ) and names( ) function. d. Find the name of each row in the first column. Hint: Use the rownames( ) function. e. Print all values that belong to a variable. f. Sort the values of variable. g. Get the statistical summary of the data.	A:10/07/2026 B:08/07/2026 C:14/07/2026	A:11/07/2026 B:11/07/2026 C:20/07/2026		
4.	CO304.1	4.1	Write a program to- a. Find the lowest or highest value in a data set. Hint: Use min( ) and max( ) functions. b.Find the index position of the max and min value in the table. Hint: use which.max( ) and which.min( )	A:11/07/2026 B:11/07/2026 C:21/07/2026	A:17/07/2026 B:15/07/2026 C:27/07/2026		

			functions.				
5.	CO304.1	5.1	Write programs to calculate Measures of Central tendency. a. Import data into R. b. Calculate the Mean (Average value) of a variable from the given data set. c. Find the Median (Mid-Point value) of the variable from the given data set. d. Calculate the mode for the variable from the given data set.(by sorting the column of the dataframe and by using the 'modest' package). e. Calculate the Percentile of the variable from the given data set.	A:17/07/2026 B:15/07/2026 C:27/07/2026	A:24/07/2026 B:22/07/2026 C:28/07/2026		
6.	CO304.1	6.1	Write programs to- a. Print Original Data Frame, Modified Frequency Table, Cumulative Frequency Table, Relative Frequency Table. b. Create the Frequency Table by using multiple arguments. c. Plot the frequency table using ggplot function.	A:24/07/2026 B:22/07/2026 C:28/07/2026	A:25/07/2026 B:25/07/2026 C:03/08/2026		
7.	CO304.1	7.1	Write programs to calculate-Variance, Standard Deviation, Range, Mean Deviation for the given data.	A:25/07/2026 B:25/07/2026 C:04/08/2026	A:31/07/2026 B:29/07/2026 C:04/08/2026		
8.	CO304.1	8.1	Write Programs to graphically represent mode and median of the given data. a. Draw Histogram for the given data. b. Draw Ogive Curve for the given data.	A:07/08/2025 B:29/07/2025 C:17/08/2025	A:08/08/2026 B:01/08/2026 C:18/08/2026		
9.	CO304.1	9.1	Write a Program to calculate Skewness for the given data.	A:08/08/2026 B:01/08/2026 C:18 /08/2026	A:14/08/2026 B:05/08/2026 C:18/08/2026		
10.	CO304.1	10.1	Write a Program to draw a scatterplot for two variables for the given dataset.	A:14/08/2026 B:05/08/2026 C:24/08/2026	A:21/08/2026 B:08/08/2026 C:25/08/2026		
11.	CO304.2	12.1	Write Program to perform the correlation test to evaluate the association between two or more variables. Pearson correlation test. Interpretation of the result. Use Spearman rank correlation coefficient to estimate a rank-based measure of association.	A:21/08/2026 B:08/08/2026 C:25/08/2026	A:22/08/2026 B:19/08/2026 C:01/09/2026		
12.	CO304.2	13.1	Write a Program based on Line of Regression using two variables.	A:22/08/2026 B:19/08/2026 C:01/0/2026	A:29/08/2026 B:29/08/2026 C:07/09/2026		
13.	CO304.3	14.1	Write Programs to- a. Calculate the probability of getting heads when flipping a fair coin. b. Calculate the probability of drawing a spade from a standard deck of 52 cards.	A:29/08/2026 B:29/08/2026 C:07/09/2026	A:04/09/2026 B:02/09/2026 C:08/09/2026		
14.	CO304.3	16.1	Write a program to compute probability using prob( ) function.	A:04/09/2026 B:02/09/2026 C:08/09/2026	A:11/09/2026 B:09/09/2026 C:14/09/2026		

15.	CO304.3	18.1	Write a program to use Bayes' Theorem in R-Programming.	A:11/09/2026 B:09/09/2026 C:14/09/2026	A:12/09/2026 B:12/09/2026 C:15/09/2026		
16.	CO304.4	19.1	Write a Program to interpolate using newton forward interpolation.	A:12/09/2026 B:12/09/2026 C:15/09/2026	A:18/09/2026 B:16/09/2026 C:21/09/2026		
17.	C0204.4	20.1	Write a Program to interpolate using newton backward interpolation.	A:18/09/2026 B:16/09/2026 C:21/09/2026	A:19/09/2026 B:19/09/2026 C:22/09/2026		
18.	CO304.4	21.1	Write a program for the implementation of extrapolation.	A:19/09/2026 B:19/09/2026 C:22/09/2026	A:03/10/2026 B:26/09/2026 C:28/09/2026		
19	CO304.5	24.1	Write a program to generate a Sampling Distribution proportion.	A:03/10/2026 B:30/09/2026 C:28/09/2026	A:09/10/2026 B:03/10/2026 C:29/09/2026		
20	CO304.5	25.1	Write a program based on t-Distribution using dt, pt, qt & rt functions.	A:09/10/2026 B:03/10/2026 C:05/10/2026	A:10/10/2026 B:07/10/2026 C:05/10/2026		
21	CO304.5	26.1	Write a program based on Chi-Square Distribution using dchisq, pchisq, qchisq & rchisq functions.	A:10/10/2026 B:07/10/2026 C:05/10/2026	A:16/10/2026 B:10/10/2026 C:06/10/2026		

- **Direct Assessment Criteria :(Practical):**

Sr. No.	**Weightage- Process related (Marks-10)**	**40%**
1.	Logic Formation	20%
2.	Debugging Ability	10%
3.	Follow Ethical Practices:	10%
	Weightage- Product related (Marks-15)	**60%**
4.	Expected Output	25%
5	Timely Submission	25%
6.	Answer to Sample questions	10%
	Total (25 Marks)	**100%**

- **Rules for Formative Assessment:**

1.Formative assessment of each practical is based on Process related (15 marks) and Product related (10 arks) - Total out of 25 marks as per the assessment scheme prescribed by MSBTE,

2. Final assessment of practicals. Following is the distribution of Marks –

i) Summative Assessment (SA-PR) for 50 Marks will be conducted by MSBTE after completion of the term.

ii) Formative assessment (FA-PR) will carry 25 Marks.

iii) Self Learning Assessment (SLA) will carry 25 Marks.

3. Final Formative Assessment (F.A.) of 25 marks is calculated as follows:

*FA Marks = ((Total obtained marks)*25)/ (25*Total Number of parcticals)*

A comprehensive Final Practical End Semester examination (SA-PR of 50 Marks) will be conducted by MSBTE at the end of semester. Examiner for this examination will be internal examiner.

4. The schedule of MSBTE Practical Examination will be display on Notice board prior to examination.

- **Practical wise LLO-CO Mapping:**

PR. No.	LLO	CO303.1	CO303.2	CO303.3	CO303.4	CO303.5
Practical 1	1.1	✓				
Practical 2	2.1	✓				
Practical 3	3.1	✓				
Practical 4	4.1	✓				
Practical 5	5.1	✓				
Practical 6	6.1	✓				
Practical 7	7.1	✓				
Practical 8	8.1	✓				
Practical 9	9.1	✓				
Practical 12	10.1	✓				
Practical 12	12.1		✓			
Practical 13	13.1		✓			
Practical 14	14.1			✓		
Practical 16	16.1			✓		
Practical 18	18.1			✓		
Practical 19	19.1				✓	
Practical 20	20.1				✓	
Practical 21	21.1				✓	
Practical 24	24.1					✓
Practical 25	25.1					✓
Practical 26	26.1					✓

- **References:**

1. Books:

Sr. No	Author	Title	Publisher with ISBN Number
1	H.K.Dass, Er.Rajnish Verma	Higher Engineering Mathematics	S. Chand Technical ISBN: 9788121938907,9788121938907
2	A.C. Srivastava, P.K. Srivastava	Engineering Mathematics	PHI Publication, New Delhi ISBN: 9788120342934
3	Grewal B. S.	Higher Engineering Mathematics	Khanna Publication New Delhi, 2013 ISBN: 8174091955
4	B. V. Ramana	Higher Engineering Mathematics	Tata Mcgraw Hill Education private limited, New Delhi. ISBN: 9780070634190, 9780070634190
5	Marvin L. Bittinger David J. Ellenbogen Scott A. Surgent	Calculus and Its Applications	Addison-Wesley 10th Edition ISBN-13: 978-0-321-69433-1
6	Andrie de Vries and Joris Meys	R For Dummies	Wiley Publisher ISBN-13: 978-8126562183
7	Jeeva Jose	Beginner's Guide for Data Analysis using R Programming	Khanna Book Publishing, First Edition ISBN-13: 978-9386173454

2. Learning websites & portals:

Sr.No	Link / Portal	Description
1	http://nptel.ac.in/courses/106102064/1	Online Learning Initiatives by IITs and IISc
2	https://ocw.mit.edu/	MIT Open courseware
3	https://www.khanacademy.org/math	Concept of Mathematics through video lectures and notes
4	www.mathworks.com/	Applications of concepts of Mathematics to coding.
5	https://amser.org/b920509/science--mathematics	AMSER (Interpolation. Extrapolation
6	https://www.coursera.org/learn/r-programming	R Programming: Free online Course

3. Tools for conducting Practicals and Assessment:

1. R-Studio
2.Google classroom
3.You tube videos
4. MKCL Era Live Learn.

Mrs. P. A. Kadam
(Name & signature of faculty)

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

CC: 1. Lab File 2.Course File-SML (313307) 3. Notice Board-AN Lab-03 4. Progressive Assessment