SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Department of Applied Mathematics	LP: Sub Code Rev. No: 00 Date: 22.01.2024
B.Tech : Artificial Intelligence and Data Science Regulation: 2022 Sub. Code / Sub. Name : MA22456 Mathematics for Machine Learning Unit : I Combinatorics	

Unit Syllabus: Mathematical induction – Strong induction and well ordering – The basics of counting – The Pigeonhole principle – Permutations and combinations – Recurrence relations – Solving linear recurrence relations – Generating functions – Inclusion and exclusion principle and its applications

Objective: Apply the concepts of basic principles of Combinatorics and its Applications.

Session No *	Topics to be covered	Ref	Teaching Aids
1	Sets and Operations	R2, Ch 2, Pg. No 115 - 138.	PPT/Black board
2	Inclusion and exclusion principle	R2, Ch 8, Pg No 552 - 558.	PPT/Black board
3	Applications of Inclusion and exclusion principle	R2, Ch 8, Pg No 558 - 565.	PPT/Black board
4	Mathematical induction	R2, Ch 5, Pg No 311 - 332.	PPT/Black board
5	Strong induction and well ordering	R2, Ch 5, Pg No 333 - 343.	PPT/Black board
6	Tutorial class	R2, Ch 2, 5, 8.	PPT/Black board
7	The basics of counting, Pigeonhole principle	R2, Ch 6, Pg No 385 - 406.	PPT/Black board
8	Permutations and combinations	R2, Ch 6, Pg No 407 - 414.	PPT/Black board
9	Tutorial class	R2, Ch 6.	PPT/Black board
10	Recurrence relations and solving linear recurrence relations	R2, Ch 8, Pg No 501 - 526.	PPT/Black board
11	Generating functions	R2, Ch 8, Pg No 537 - 557.	PPT/Black board
12	Tutorial class	R2, Ch 8.	PPT/Black board

Content beyond syllabus covered (if any):
Functions, sequences and summations

* Session duration: 50 minutes

Sub. Code / Sub. Name: MA22456 Mathematics for Machine Learning

Unit : II Vector spaces

Unit Syllabus: Vector spaces – Subspaces – Linear combinations and linear system of equations – Linear independence and linear dependence – Bases and dimensions.

Objective: Understand the concepts of vector spaces.

Session No *	Topics to be covered	Ref	Teaching Aids
13	Vector spaces – Definition and examples	R4, Ch 1, Pg. No 1 – 8.	PPT/Black board
14	Properties of vector spaces	R4, Ch 1, Pg. No 8 – 12.	PPT/Black board
15	More examples of vector spaces	R4, Ch 1, Pg. No 12 – 16.	PPT/Black board
16	Subspaces of vector space – Definition and examples	R4, Ch 1, Pg. No 16 – 23.	PPT/Black board
17	Tutorial class	R4, Ch 1, Pg. No 1 – 23.	PPT/Black board
18	Linear combination and linear system of equations	R4, Ch 1, Pg. No 24 – 34.	PPT/Black board
19	Linear independence and linear dependence	R4, Ch 1, Pg. No 35 – 41.	PPT/Black board
20	Tutorial class	R4, Ch 1, Pg. No 24 – 41.	PPT/Black board
21	Basis of a vector space – Definition and examples	R4, Ch 1, Pg. No 42 – 50.	PPT/Black board
22	Dimensions and span	R4, Ch 1, Pg. No 51 – 58.	PPT/Black board
23	More examples involving dimensions and span	R4, Ch 1, Pg. No 58 – 60.	PPT/Black board
24	Tutorial class	R4, Ch 1, Pg. No 42 - 60	PPT/Black board

Content beyond syllabus covered (if any):

* Session duration: 50 mins

Sub. Code / Sub. Name: MA22456 Mathematics for Machine Learning

Unit : III Principal component Analysis

Unit Syllabus: Data Reduction Techniques - Definition of Population Principal Components - Principal Components obtained by Standardized variables - Rules to retain number of Principal Components using Scree Plot.

Objective: Understand the fundamental concepts of Principal component Analysis.

Session No *	Topics to be covered	Ref	Teaching Aids
25	Principal component Analysis - Introduction	R3, Ch 12, Pg. No 380 – 381.	PPT/Black board
26	Data reduction techniques	R3, Ch 12, Pg. No 381 – 385.	PPT/Black board
27	Population principal components	R3, Ch 12, Pg. No 385 – 387.	PPT/Black board
28	Principal components and perpendicular regression	R3, Ch 12, Pg. No 387 – 389.	PPT/Black board
29	Tutorial class	R3, Ch 12, Pg. No 380 – 389.	PPT/Black board
30	Principal components obtained by standardized variables	R1, Ch 10 Pg. No 333 – 339.	PPT/Black board
31	Deciding how many components to retain	R3, Ch 12, Pg. No 397 – 400.	PPT/Black board
32	Tutorial class	R3, Ch 12, Pg. No 397 – 400.	PPT/Black board
33	Plotting of principal components	R3, Ch 12, Pg. No 389 – 391.	PPT/Black board
34	Principal components from the correlation matrix	R3, Ch 12, Pg. No 391 – 393.	PPT/Black board
35	Rules to retain number of Principal Components using Scree Plot.	R3, Ch 12, Pg. No 393 – 401.	PPT/Black board
36	Tutorial class	R3, Ch 12, Pg. No 389 – 401.	PPT/Black board

Content beyond syllabus covered (if any):

* Session duration: 50 mins

Sub. Code / Sub. Name: MA22456 Mathematics for Machine Learning

Unit: IV Solution of equations and eigen value problems.

Unit Syllabus: Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method- Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel – Eigenvalues of a matrix by Power method and Jacobi's method for symmetric matrices.

Objective: Acquaint the knowledge of the basic concepts of solving algebraic and transcendental equations.

Session No *	Topics to be covered	Ref	Teaching Aids
37	Solution of algebraic and transcendental equations	R5, Ch 1, Pg. No 1 – 4.	PPT/Black board
38	Fixed point iteration method	R5, Ch 1, Pg. No 15 – 19.	PPT/Black board
39	Newton Raphson method	R5, Ch 1, Pg. No 11 – 14.	PPT/Black board
40	Tutorial class	R5, Ch 1, Pg. No 1 – 19.	PPT/Black board
41	Solution of linear system of equations - Gauss elimination method	R5, Ch 1, Pg. No 25 – 33.	PPT/Black board
42	Gauss Jordan method	R5, Ch 1, Pg. No 33 – 35.	PPT/Black board
43	Tutorial class	R5, Ch 1, Pg. No 25 – 35.	PPT/Black board
44	Solution of linear system of equations - Iterative methods - Gauss Jacobi method	R5, Ch 1, Pg. No 41 – 46.	PPT/Black board
45	Gauss Seidel method	R5, Ch 1, Pg. No 46 – 51.	PPT/Black board
46	Eigenvalues of a matrix - Power method	R5, Ch 1, Pg. No 52 – 54.	PPT/Black board
47	Jacobi's method for symmetric matrices	R5, Ch 1, Pg. No 52 – 58.	PPT/Black board
48	Tutorial class	R5, Ch 1, Pg. No 41 – 58.	PPT/Black board

Content beyond syllabus covered (if any):

* Session duration: 50 mins

Sub. Code / Sub. Name: MA22456 Mathematics for Machine Learning

Unit: V Interpolation, Numerical Differentiation and Numerical Integration.

Unit Syllabus: Lagrange's and Newton's divided difference interpolations – Newton's forward and backward difference interpolation – Approximation of derivatives using interpolation polynomials – Numerical single and double integrations using Trapezoidal and Simpson's 1/3 rules.

Objective: Provide the numerical techniques of interpolation in various intervals and numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines.

Session No *	Topics to be covered	Ref	Teaching Aids
49	Lagrange's Interpolation Formula	R5, Ch 2, Pg. No 63 – 69.	PPT/Black board
50	Newton's Divided difference Interpolation formula	R5, Ch 2, Pg. No 70 – 76.	PPT/Black board
51	Newton's Forward Difference formula	R5, Ch 2, Pg. No 80 – 85.	PPT/Black board
52	Newton's Backward Difference formula	R5, Ch 2, Pg. No 85 – 97.	PPT/Black board
53	Tutorial Class	R5, Ch 2, Pg. No 63 – 97.	PPT/Black board
54	Approximation of derivatives using Interpolation polynomials	R5, Ch 3, Pg. No 109 – 112.	PPT/Black board
55	Newton's forward and backward difference formula for finding the values of the derivatives.	R5, Ch 3, Pg. No 112 – 123.	PPT/Black board
56	Tutorial class	R5, Ch 3, Pg. No 109 – 123.	PPT/Black board
57	Numerical Integration – Simpson's 1/3 rule	R5, Ch 3, Pg. No 136 – 146.	PPT/Black board
58	Trapezoidal rule	R5, Ch 3, Pg. No 128 – 135.	PPT/Black board
59	Numerical Double Integration	R5, Ch 3, Pg. No 169 – 176.	PPT/Black board
60	Tutorial class	R5, Ch 3, Pg. No 136 – 176.	PPT/Black board

Content beyond syllabus covered (if any):

* Session duration: 50 mins

Sub Code / Sub Name: MA22456 Mathematics for Machine Learning

REFERENCES:

1. M. P. Deisenroth, A. A. Faisal, C. S. Ong, "Mathematics for Machine Learning", Cambridge University Press, 2020.
2. Kenneth H. Rosen, "Discrete Mathematics & its Applications", Tata McGraw-Hill (SIE), 7th edition, 2017.
3. Alvin C.Rencher, "Methods of Multivariate Analysis", 2nd Edition, Wiley Inter-science, 2002
4. Friedberg, A.H., Insel, A.J. and Spence, L., "Linear Algebra", Prentice Hall of India, New Delhi, 2004.
5. Iyengar, S.R.K., and Jain, R.K, "Numerical Methods", New Age International Publishers, 2012.

	Prepared by	Approved by
Signature	G. Satheesh	
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Date	22.01.2024	22.01.2024
Remarks *:		
Remarks *:		

* If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE OUTCOMES - THEORY
ANNEXURE – I

Department of Applied Mathematics		
Academic Year	: 2023 - 2024	Semester: EVEN
B.Tech : Artificial Intelligence and Data Science		Regulation : 2022
Sub. Code / Sub. Name	: MA22456 Mathematics for Machine Learning	

CO	Statements	RBT* Level
CO1	Apply the Counting Principles to compute the running time algorithm.	AP
CO2	Explain the fundamental concepts of Linear Algebra.	AP
CO3	Demonstrate the use of the concepts of Principal component Analysis	AP
CO4	Solve algebraic, transcendental and linear system of equations.	AP
CO5	Appreciate the numerical techniques of interpolation in various intervals and apply the numerical techniques of differentiation and integration for engineering	AP

***** Revised Bloom's Taxonomy

Mapping CO – PO – PSO *

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	3	3	2									1	1	
CO2	3	3	2	2								1	1	
CO3	3	3	2	2								1	1	
CO4	3	3										1		
CO5	3	3										1		

* Put a 'X' for the mapping

CO ATTAINMENT

CO	Target (%) (A)	Achieved (%) (B)	Gap (%) (A-B)
CO1			
CO2			
CO3			
CO4			
CO5			

SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE OUTCOMES - THEORY
ANNEXURE – 1
BRIDGING THE GAP IN CO

CO	ACTION PLAN
CO1	
CO2	
CO3	
CO4	
CO5	

PO ATTAINMENT

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
Attainment (%)														

Signature of Faculty / Course Coordinator	**Signature of Module Coordinator**