

S. No.	Lecture No.	Unit No.	Topic	Sessional Outcome	Experiential Learning	Participative Learning	Problem Solving Methodologies	ICT Tools & E-Resources Utilization	Mapping with CO	Class Material (PPT Faculty/ Students)	Additional Material (Links/ Journals/ Articles/ NEWS)	Mode of Assessment	Status
1	L1	1	Probability Introduction	Students will able to Understand basic concepts of probability	Demonstration of loops	Discussion	Brainstorming	https://www.cuemath.com/conditional-probability-formula/	CO1	PPT	https://www.youtube.com/watch?v=WB6tUx0f8d4n	Questions from	
2	L2	1	Axiomatic definition	Understand basic concepts of probability	Demonstration of loops	Lecture through PPT	Brainstorming	https://www.cuemath.com/conditional-probability-formula/	CO1	PPT	https://www.youtube.com/watch?v=WB6tUx0f8d4n	Questions from	
3	L3	1	Addition Theorem	Understand the addition	Demonstration of loops	Lecture through PPT	Brainstorming	https://www.cuemath.com/conditional-probability-formula/	CO1	PPT	https://www.youtube.com/watch?v=WB6tUx0f8d4n	Questions from	
4	L4	1	Multiplication theorem	Understand the addition and multiplication theorem	Demonstration of loops	Lecture through PPT	Brainstorming	https://www.cuemath.com/conditional-probability-formula/	CO1	PPT	https://www.youtube.com/watch?v=WB6tUx0f8d4n	Questions from	
5	L5	1	Conditional Probability	Understand conditional prob	Demonstration of loops	Flipped Classroom	Brainstorming	https://www.cuemath.com/conditional-probability-formula/	CO1	Student PPT	https://www.youtube.com/watch?v=WB6tUx0f8d4n	PPT by Student	
6	L6	1	Baye's Theorem and its applications	Understand the concept of baye's theorem with the help of example	Demonstration of loops	Flipped Classroom	Brainstorming	https://www.cuemath.com/conditional-probability-formula/	CO1	Student PPT	https://www.youtube.com/watch?v=WB6tUx0f8d4n	PPT by Student	
7	L7	1	Random Variable	Understand the role of random variable and PMF and PDF	Demonstration of loops	Flipped Classroom	Brainstorming	https://www.cuemath.com/conditional-probability-formula/	CO1	Student PPT	https://www.youtube.com/watch?v=WB6tUx0f8d4n	PPT by Student	
8	L8	1	Probability Mass function	Understand the role of random variable and PMF and PDF	Demonstration of loops	Flipped Classroom	Brainstorming	https://www.cuemath.com/conditional-probability-formula/	CO1	Student PPT	https://www.youtube.com/watch?v=WB6tUx0f8d4n	PPT by Student	
9	L9	1	Probability density function	Understand the role of random variable and PMF and PDF	Demonstration of loops	Discussion	Brainstorming	https://www.cuemath.com/conditional-probability-formula/	CO1	PPT	https://www.youtube.com/watch?v=WB6tUx0f8d4n	Viva-1	
10	L10	1	Binomial Distribution	Understand the binomial distribution with example	Demonstration of loops	Lecture through PPT	Brainstorming	https://www.cuemath.com/conditional-probability-formula/	CO1	PPT	https://www.youtube.com/watch?v=WB6tUx0f8d4n	Viva-1	
11	L11	1	Normal Distribution	Understand the binomial distribution with example	Demonstration of loops	Lecture through PPT	Practical	https://www.cuemath.com/conditional-probability-formula/	CO1	PPT	https://www.youtube.com/watch?v=WB6tUx0f8d4n	Viva-1	
12	L12	2	Forward, Backward Difference,	Understand the backward difference	Demonstration of loops	Lecture through PPT	Practical	Excel	CO1	PPT	https://www.tutoritall.com/what-is-matrix/		
13	L13	2	Shift Operators	Understand the Shift Operators	Demonstration of loops	Group Discussion	Practical	https://www.youtube.com/watch?v=WB6tUx0f8d4n	CO1	PPT	https://www.tutoritall.com/what-is-matrix/	Questions from Assignment	
14	L14	2	Interpolation Formulae-Newton's Forward	Understand the concept of Interpolation using Newton's Forward	Demonstration of loops	Group Discussion	Practical	https://www.youtube.com/watch?v=WB6tUx0f8d4n	CO1	PPT	https://www.tutoritall.com/what-is-matrix/	Questions from Assignment	
15	L15	2	Interpolation Formulae-Newton's Backward	Understand the Backward difference	Demonstration of loops	Flipped Classroom	Practical	https://www.youtube.com/watch?v=WB6tUx0f8d4n	CO1	Student PPT	https://www.tutoritall.com/what-is-matrix/	PPT by Student	
16	L16	2	Interpolation Formulae-Newton's Backward	Understand the Backward difference	Demonstration of loops	Flipped Classroom	Practical	https://www.youtube.com/watch?v=WB6tUx0f8d4n	CO1	PPT	https://www.tutoritall.com/what-is-matrix/		
17	L17	2	Divided difference formula	understand the difference formula and how it is differ from above two	Demonstration	Flipped Classroom	Practical	https://www.youtube.com/watch?v=WB6tUx0f8d4n	CO2	PPT	https://www.tutoritall.com/what-is-matrix/	Questions from Assignment	
18	L18	2	Langrange's Formula	Understand the Langrange's formula and advantage of this formula	Demonstration	Flipped Classroom	Practical	https://www.youtube.com/watch?v=WB6tUx0f8d4n	CO2	PPT	https://www.tutoritall.com/what-is-matrix/	Questions from Assignment	
19	L19	2	Bisection method	Understand the concept of bisection method with example	Demonstration	Flipped Classroom	Practical	https://www.youtube.com/watch?v=WB6tUx0f8d4n	CO2	PPT	https://www.tutoritall.com/what-is-matrix/	Questions from Assignment	
20	L20	2	False position method	Understand the concept of false position method with example	Demonstration	Flipped Classroom	Practical	https://www.youtube.com/watch?v=WB6tUx0f8d4n	CO1, CO2	PPT	https://www.tutoritall.com/what-is-matrix/		
21	L21	2	Newton Raphson method	Understand the concept of NR method	Demonstration	Discussion	Practical	https://www.youtube.com/watch?v=WB6tUx0f8d4n	CO1, CO2	PPT	https://www.tutoritall.com/what-is-matrix/	Viva-2	
22	L22	3	Gaussian Elimination Method	Understand the gauss elimination with example	Numerical	Lecture through PPT	Practical	https://www.youtube.com/watch?v=WB6tUx0f8d4n	CO1, CO2	PPT	https://www.tutoritall.com/what-is-matrix/	Viva-2	

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23	L23	3	LU decomposition	Understand the concept of LU decomposition	Numerical	Flipped Classroom	Practical	https://www.coursera.org/lecture/c-for-everyone/storage	CO2	PPT	https://youtu.be/Pu6e0QwaK1Q	Viva-2	
24	L24	3	Gauss jacob method	Understand the concept of gauss jacob with example	Numerical	Flipped Classroom	Practical	https://www.youtube.com/watch?v=ZJTc1etqK0s	CO2	PPT	https://youtu.be/Pu6e0QwaK1Q	Viva-2	
25	L25	3	Gauss seidel method	Understand the concept of Gauss seidel with example		Flipped Classroom	Practical	https://www.youtube.com/watch?v=ZJTc1etqK0s	CO1,CO2	PPT	https://www.youtube.com/watch?v=X45pdR4lc3M		
26	L26	3	Gauss jordan method	Understand the concept of Gauss jordan with example	Numerical	Lecture through PPT	Practical	https://www.youtube.com/watch?v=4sPWotthkgw	CO1,CO2	PPT	https://youtu.be/kM12yeyrANU	Viva-3	
27	L27	3	Numerical Differentiation	Understand the concept of numerical differentiation on tabular form	Numerical	Lecture through PPT	Brainstorming	https://www.youtube.com/watch?v=4sPWotthkgw	CO1,CO2	PPT	https://youtu.be/kM12yeyrANU	Viva-3	
28	L28	3	First order differentiation	How will apply first order on tabular data and non tabular data format?	Numerical	Lecture through PPT	Brainstorming	https://www.youtube.com/watch?v=xpYixlafdg	CO1,CO2	PPT	https://youtu.be/kM12yeyrANU	Viva-3	
29	L29	3	Second order differentiation	Understand the concept of second differentiation	Numerical	Flipped Classroom	Brainstorming	https://www.youtube.com/watch?v=4sPWotthkgw	CO1,CO2	Student PPT	https://www.youtube.com/watch?v=udfbq4M2Kfc	Student PPT	
30	L30	3	Numerical Integration	Understand the concept of numerical integration	Numerical	Flipped Classroom	Brainstorming	https://www.youtube.com/watch?v=4sPWotthkgw	CO1,CO2	Student PPT	https://youtu.be/US42Z8A0c8Y	Student PPT	
31	L31	3	Trapezoidal Rule	Understand the trapezoidal rule with example	Numerical	Flipped Classroom	Brainstorming	https://www.youtube.com/watch?v=_NEJVGp8Q	CO1,CO2	Student PPT	https://youtu.be/US42Z8A0c8Y	Student PPT	
32	L32	3	Simpsons 1/3 rule	Understand the Simpson 1/3 rule with example	Numerical	Flipped Classroom	Brainstorming	https://www.youtube.com/watch?v=Ij71sDmmKpc		PPT	https://youtu.be/US42Z8A0c8Y		
33	L33	4	Formulation of linear Programming model	Understand the Basic concept of linear programming	Numerical	Flipped Classroom	Brainstorming	https://www.youtube.com/watch?v=E-CRY8LTBSw	CO1,CO2	PPT	https://youtu.be/US42Z8A0c8Y	Viva	
34	L34	4	Graphical method of solving linear	Understand the graphical method with example	Numerical	Flipped Classroom	Brainstorming	https://www.youtube.com/watch?v=4sPWotthkgw	CO1,CO3	PPT	https://youtu.be/Bn7QCzJxIY4	Viva	
35	L35	4	Simplex Method (Maximization and Minimization)	Understand the concept of simplex method and how find maximization and Minimization	Numerical	Lecture through PPT	Brainstorming	https://www.youtube.com/watch?v=sulNiv7LQNO	CO1,CO3	PPT	https://youtu.be/Bn7QCzJxIY4	Viva	
36	L36	4	General structure of transportation	Understand the transportation problems	Numerical	Lecture through PPT	Brainstorming	https://www.youtube.com/watch?v=4sPWotthkgw	CO1,CO3	PPT	https://youtu.be/Bn7QCzJxIY4		
37	L37	4	solution procedure for transportation problem	Understand the procedure for TP	Numerical	Lecture through PPT	Brainstorming	https://www.youtube.com/watch?v=AE-27BSbkj4	CO1,CO3	PPT	https://youtu.be/Bn7QCzJxIY4	Viva	
38	L38	4	methods for finding initial solution	Understand the method to find the initial solution	Numerical	Discussion	Brainstorming	https://www.youtube.com/watch?v=AE-27BSbkj4	CO1,CO3	PPT	https://youtu.be/Bn7QCzJxIY4	Viva	
39	L39	4	test for optimality	Understand the method to find the test for optimality	Numerical	Lecture through PPT	Brainstorming	https://www.youtube.com/watch?v=AE-27BSbkj4	CO1,CO3	PPT	https://youtu.be/Bn7QCzJxIY4	Viva	

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40	L40	4	Maximization of transportation problem	Understand how find the maximization of TP	Numerical	Lecture through PPT	Brainstorming	https://www.youtube.com/watch?v=m5gYw37J8c4	CO1,CO3	PPT	https://youtu.be/Bn7QCzJxIY4	
41	L41	4	unbalanced transportation problem	Understand the concept of unbalanced Tranpostation problem	Numerical	Discussion	Brainstorming	https://www.youtube.com/watch?v=sJXT03E2oxM	CO1,CO3	PPT	https://youtu.be/Bn7QCzJxIY4	Viva
42	L42	4	Assignment problem approach of the assignment model	Understand assignment peoblem	Numerical	Discussion	Brainstorming	https://www.youtube.com/watch?v=5_FPMrriA3D	CO1,CO3	PPT	https://youtu.be/Bn7QCzJxIY4	Viva
43	L43	4	Solution methods of assignment problem,Maximization in an assignment	Understand the method of assignment problem	Numerical	Lecture through PPT	Brainstorming	https://www.youtube.com/watch?v=5_FPMrriA3D	CO1,CO3	PPT	https://youtu.be/Bn7QCzJxIY4	Viva
44	L44	4	Unbalanced assignment problem,Restriction on assignment	Understand the concept of maximization In an assignment	Numerical	Lecture through PPT	Brainstorming	https://www.youtube.com/watch?v=0rLIYpy2CqQ	CO1,CO3	PPT	https://youtu.be/Bn7QCzJxIY4	Viva
45	L45	4	SOLUTION OF LINEAR SIMULTANEOUS EQUATIONS	Understand the concept of SOLUTION OF LINEAR SIMULTANEOUS EQUATIONS	Numerical	Lecture through PPT	Brainstorming	https://www.youtube.com/watch?v=NUnJrmVlUc	CO1,CO3	PPT	https://youtu.be/Bn7QCzJxIY4	Viva
46	L46	4	SOLUTION OF LINEAR SIMULTANEOUS EQUATIONS	Revised & Understand the concept of SOLUTION OF LINEAR SIMULTANEOUS EQUATIONS	Numerical	Lecture through PPT	Brainstorming	https://www.youtube.com/watch?v=NUnJrmVlUc	CO1,CO3	PPT	https://youtu.be/Bn7QCzJxIY4	Viva
47	L47	4	Gaussian Elimination	Revised & Understand the concept of SOLUTION OF LINEAR SIMULTANEOUS EQUATIONS	Numerical	Discussion	Brainstorming	https://www.youtube.com/watch?v=nACnUIH7J6g	CO1,CO3	PPT	https://youtu.be/Bn7QCzJxIY4	Viva
48	L48	4	Method with and without Row Interchange:	Revised & Understand the concept Gaussian Elimination Method with and without Row Interchange:	Numerical	Discussion	Brainstorming	E-Research Paper https://royalsocietypublishing.org/doi/full/10.1098/	CO1,CO3	PPT	https://youtu.be/Bn7QCzJxIY4	
49	L49	4	LU Decomposition	Understand the concept LU Decomposition.		Flipped Classroom	Brainstorming	https://www.youtube.com/watch?v=5_FPMrriA3D	CO4	Student PPT	https://youtu.be/Bn7QCzJxIY4	Student PPT
50	L50	4	NUMERICAL DIFFERENTIATION	Understand the NUMERICAL DIFFERENTIATION		Flipped Classroom	Brainstorming	https://www.youtube.com/watch?v=5_FPMrriA3D	CO4	Student PPT	https://youtu.be/Bn7QCzJxIY4	Student PPT
51	L51	4	First and Second Order	Understand theFirst and Second Order		Flipped Classroom	Brainstorming	https://www.youtube.com/watch?v=5_FPMrriA3D	CO4	Student PPT	https://youtu.be/Bn7QCzJxIY4	Student PPT
52	L52	4	Derivatives at Tabular	Understand the Derivatives at Tabular		Flipped Classroom	Brainstorming	https://www.youtube.com/watch?v=5_FPMrriA3D	CO4	Student PPT	https://youtu.be/Bn7QCzJxIY4	Student PPT
53	L53	4	Non-Tabular Points,	Understand the Non-Tabular Points		Flipped Classroom	Brainstorming	https://www.youtube.com/watch?v=5_FPMrriA3D	CO4	Student PPT	https://youtu.be/Bn7QCzJxIY4	Student PPT
54	L54	4	NUMERICAL INTEGRATION	Understand the NUMERICAL INTEGRATION		Flipped Classroom	Brainstorming	https://www.youtube.com/watch?v=NUnJrmVlUc	CO4	Student PPT	https://youtu.be/Bn7QCzJxIY4	Student PPT
55	L55	4	Trapezoidal Rule	Understand the Trapezoidal Rule		Flipped Classroom	Brainstorming	https://www.tutorialspoint.com/	CO1	Student PPT	https://youtu.be/Bn7QCzJxIY4	Student PPT
56	L56	4	Simpsons 1/3 Rule	Understand the Simpsons 1/3 Rule		Flipped Classroom	Brainstorming	https://www.tutorialspoint.com/	CO1	Student PPT	https://youtu.be/Bn7QCzJxIY4	Student PPT

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57	L57	4	Error in Each	Understand the Error in Each		Discussion	Brainstorming	https://en.wikipedia.org/wiki/Process_h	CO4	PPT	https://youtu.be/Bn7QCzixY4	Viva	
58	L58	4	Formula (without proof.)	Understand the Formula (without proof.)		Discussion	Brainstorming	https://en.wikipedia.org/wiki/Process_h	CO4	PPT	https://youtu.be/Bn7QCzixY4	Viva	
59	L59	4	Jordan Method	Understand the concep Jordan Method		Discussion & Doubt Clearing session	Brainstorming	https://en.wikipedia.org/wiki/Process_h	CO4	PPT	https://youtu.be/Bn7QCzixY4	Viva	
60	L60	4	Matrix Method.	Understand the Matrix Method.		Discussion & Doubt Clearing session	Brainstorming	https://en.wikipedia.org/wiki/Process_h	CO4	PPT	https://youtu.be/Bn7QCzixY4	Viva	

Note : 1 Credit (Theory) =15 Hrs. in a Semester; 1 Credit (Practical) =30 Hrs. in a Semester.

Suggested Readings :(Latest Edition)

TEXTBOOKS

TB1.	1. S. Sastry, "Numerical Analysis", Prentice Hall of India, 1998.
TB2.	2. Johnson, R., Miller, L. and Freund, J., McGraw and Freund's "Probability and Statistics for Poisson Education (2005)
TB3.	3. Singh J "Probability and Numerical Methods" ANE Books, 4th Edition 2019
TB4.	4. Sharma, J.K., Operations Research: problems & solutions, Macmillan India

JOURNALS

1. Mathematical Foundations of Computing
2. Mathematics in Computer Science
3. Mathematical Structures in Computer Science
4. Foundation of Computational Mathematics

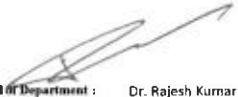
REFERENCE BOOKS:

RB1.	1. Grewal BS "Numerical Methods in Engineering and Science" Khanna Publishers, 2012
RB2.	2. Alex Leon & Mathews Leon, "Introduction to Computers", Vikas Publishing.
RB3.	3. Gupta S C, Kapoor V K "Fundamental of Mathematical Statistics" Sultan Chand and Sons 11th edition 2002
RB4.	4. Manmohan, Gupta, P.K., Xanti Swarup "Introduction to Management sciences operations research" Sultan Chand

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