

# TECNIA INSTITUTE OF ADVANCED STUDIES

## GRADE 'A' INSTITUTE

### Department of Information Communication & Technology

#### COURSE PLAN

ACADEMIC SESSION 2024-25

**# As per Scheme & Syllabus (w.e.f. Academic Session 2024-2025 onwards); As per UGC Curriculum & Credit Framework for Undergraduate Programme (CCFUP) [Dec 2022] Guru Gobind Singh Indraprastha University, New Delhi.**

<b>PROGRAMME CODE:</b>	020	<b>PROGRAMME:</b>	Bachelor of Computer Applications (BCA)	<b>SHIFT:</b>	1ST			L	4	T/P	0		Credits	4
<b>COURSE CODE:</b>	BCA-107T	<b>COURSE NAME:</b>	Mathematical Foundation for Computer Science	<b>SECTION:</b>	A									
		<b>COURSE TYPE:</b>	Core Course Theory (CCT)	<b>FACULTY:</b>	Mr. Sukant Vats									

**LEARNING OBJECTIVES:**

1. The Knowledge of mathematical probability
2. Understanding of various numerical techniques
3. Familiarity with the Linear Programming and its applications

**PREREQUISITE:** Basic Concepts of Mathematics

#### COURSE OUTCOME & MAPPING, COURSE ARTICULATION

	DISCIPLINARY KNOWLEDGE:	PROBLEM ANALYSIS:	DESIGN / DEVELOPMENT OF SOLUTIONS:	MODERN TOOL USAGE:	PROFESSIONAL ETHICS:	LIFE-LONG LEARNING:	PROJECT MANAGEMENT AND FINANCE:	COMMUNICATION EFFICACY WITH COOPERATION/TEAMWORK:	SOCIAL AND ENVIRONMENTAL CONCERN:	INNOVATION AND ENTREPRENEURSHIP:
	Apply the knowledge of computer application concepts and domain knowledge to solve the problems in IT domain/IT industry.	Identify, formulate, review research literature, and analyse complex computer application problem at their workplace and for the society.	Create, select, adapt and apply appropriate techniques, resources, and modern computing tools to complex computer application activities, with an understanding of the limitations.	Understand and commit to professional ethics and cyber regulations, responsibilities, and norms of professional computing practices.	Recognize the need, and have the ability, to engage in independent learning for continual development as a computing professional.	Demonstrate knowledge and understanding of the computing and managing projects and in multidisciplinary environments.	Communicate effectively with the computing community, and with society at large, about complex computing activities by being able to comprehend and write effective reports, design documentation, make effective presentations, and give and understand clear instructions. Function effectively as an individual and as a member or a leader.	Understand and assess societal, environmental, health, safety, legal, and cultural issues within local and global contexts, and the consequential responsibilities relevant to professional computing practices.	Identify a timely opportunity and using initiative to pursue that opportunity to create value and wealth for the betterment of the individual and society at large.	

	DISCIPLINARY KNOWLEDGE	PROBLEM ANALYSIS	DESIGN / DEVELOPMENT OF SOLUTIONS	MODERN TOOL USAGE	PROFESSIONAL ETHICS	LIFE-LONG LEARNING	PROJECT MANAGEMENT AND FINANCE	COMMUNICATION EFFICACY WITH COOPERATION/TEAMWORK	SOCIAL AND ENVIRONMENTAL CONCERN	INNOVATION AND ENTREPRENEURSHIP:	
	CO - PO MAPPING	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	Understand the various approaches dealing the data using theory of Probability		2	1	2	-	-	1	-	-	1
CO2	Understand various numerical techniques and apply them to solve real life problems		2	1	2	-	-	1	-	-	1
CO3	Understand various techniques to solve linear simultaneous equations		2	1	2	-	-	1	-	-	1
CO4	Analyse and evaluate the accuracy of common Numerical Methods		2	1	2	-	-	1	-	-	1
	<b>Course Articulation {Average}</b>		2	1	2	-	3	1	-	-	1

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S. No.	Lecture No.	Unit-No	Topic	Sessional Outcome Students will able to	Experiential Learning	Participative Learning	Problem Solving Methodologies	ICT Tools & E-Resources Utilization	Mapping with CO	Class Material (PPT Faculty+ Students)	Additional Material (Links/ Normals/ Articles/ News)	Mode of Assessment	Status
1	L1	1	Probability Introduction	Understand basic concepts of probability	Demonstration of loops	Discussion	Brainstorming	<a href="https://www.youtube.com/watch?v=VWmBzUOQd8g">https://www.youtube.com/watch?v=VWmBzUOQd8g</a>	CO1	PPT	<a href="https://www.youtube.com/watch?v=VWmBzUOQd8g">https://www.youtube.com/watch?v=VWmBzUOQd8g</a>	Questions from	
2	L2	1	Axiomatic definition	Understand basic concepts of probability	Demonstration of loops	Lecture through PPT	Brainstorming	<a href="https://www.youtube.com/watch?v=VWmBzUOQd8g">https://www.youtube.com/watch?v=VWmBzUOQd8g</a>	CO1	PPT	<a href="https://www.youtube.com/watch?v=VWmBzUOQd8g">https://www.youtube.com/watch?v=VWmBzUOQd8g</a>	Questions from	
3	L3	1	Addition Theorem	Understand the addition	Demonstration of loops	Lecture through PPT	Brainstorming	<a href="https://www.youtube.com/watch?v=VWmBzUOQd8g">https://www.youtube.com/watch?v=VWmBzUOQd8g</a>	CO1	PPT	<a href="https://www.youtube.com/watch?v=VWmBzUOQd8g">https://www.youtube.com/watch?v=VWmBzUOQd8g</a>	Questions from	
4	L4	1	Multiplication theorem	Understand the addition and multiplication theorem	Demonstration of loops	Lecture through PPT	Brainstorming	<a href="https://www.youtube.com/watch?v=VWmBzUOQd8g">https://www.youtube.com/watch?v=VWmBzUOQd8g</a>	CO1	PPT	<a href="https://www.youtube.com/watch?v=VWmBzUOQd8g">https://www.youtube.com/watch?v=VWmBzUOQd8g</a>	Questions from	
5	L5	1	Conditional Probability	Understand conditional prob	Demonstration of loops	Flipped Classroom	Brainstorming	<a href="https://www.youtube.com/watch?v=VWmBzUOQd8g">https://www.youtube.com/watch?v=VWmBzUOQd8g</a>	CO1	Student PPT	<a href="https://www.youtube.com/watch?v=VWmBzUOQd8g">https://www.youtube.com/watch?v=VWmBzUOQd8g</a>	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	<a href="https://www.youtube.com/watch?v=VWmBzUOQd8g">https://www.youtube.com/watch?v=VWmBzUOQd8g</a>	CO1	Student PPT	<a href="https://www.youtube.com/watch?v=VWmBzUOQd8g">https://www.youtube.com/watch?v=VWmBzUOQd8g</a>	PPT by Student	
7	L7	1	Random Variable	Understand the role of random variable and PMF and PDF	Demonstration of loops	Flipped Classroom	Brainstorming	<a href="https://www.youtube.com/watch?v=VWmBzUOQd8g">https://www.youtube.com/watch?v=VWmBzUOQd8g</a>	CO1	Student PPT	<a href="https://www.youtube.com/watch?v=VWmBzUOQd8g">https://www.youtube.com/watch?v=VWmBzUOQd8g</a>	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	<a href="https://www.youtube.com/watch?v=VWmBzUOQd8g">https://www.youtube.com/watch?v=VWmBzUOQd8g</a>	CO1	Student PPT	<a href="https://www.youtube.com/watch?v=VWmBzUOQd8g">https://www.youtube.com/watch?v=VWmBzUOQd8g</a>	PPT by Student	
9	L9	1	Probability density function	Understand the role of random variable and PMF and PDF	Demonstration of loops	Discussion	Brainstorming	<a href="https://www.youtube.com/watch?v=VWmBzUOQd8g">https://www.youtube.com/watch?v=VWmBzUOQd8g</a>	CO1	PPT	<a href="https://www.youtube.com/watch?v=VWmBzUOQd8g">https://www.youtube.com/watch?v=VWmBzUOQd8g</a>	Viva-1	
10	L10	1	Binomial Distribution	Understand the binomial distribution with example	Demonstration of loops	Lecture through PPT	Brainstorming	<a href="https://www.youtube.com/watch?v=VWmBzUOQd8g">https://www.youtube.com/watch?v=VWmBzUOQd8g</a>	CO1	PPT	<a href="https://www.youtube.com/watch?v=VWmBzUOQd8g">https://www.youtube.com/watch?v=VWmBzUOQd8g</a>	Viva-1	
11	L11	1	Normal Distribution	Understand the binomial distribution with example	Demonstration of loops	Lecture through PPT	Practical	<a href="https://www.youtube.com/watch?v=VWmBzUOQd8g">https://www.youtube.com/watch?v=VWmBzUOQd8g</a>	CO1	PPT	<a href="https://www.youtube.com/watch?v=VWmBzUOQd8g">https://www.youtube.com/watch?v=VWmBzUOQd8g</a>	Viva-1	
12	L12	2	Forward,Backward Difference,	Understand the backward difference	Demonstration of loops	Lecture through PPT	Practical	<a href="https://www.youtube.com/watch?v=VWmBzUOQd8g">https://www.youtube.com/watch?v=VWmBzUOQd8g</a>	CO1	PPT	<a href="https://www.youtube.com/watch?v=VWmBzUOQd8g">https://www.youtube.com/watch?v=VWmBzUOQd8g</a>		
13	L13	2	Shift Operators	Understand the Shift Operators	Demonstration of loops	Group Discussion	Practical		CO1	PPT	<a href="https://www.youtube.com/watch?v=VWmBzUOQd8g">https://www.youtube.com/watch?v=VWmBzUOQd8g</a>	Questions from Assignment	
14	L14	2	Interpolation Formulæ-Newton's Forward	Undersatnd the concept of Interpolation using Newton's Forward	Demonstration of loops	Group Discussion	Practical	<a href="https://www.youtube.com/watch?v=VWmBzUOQd8g">https://www.youtube.com/watch?v=VWmBzUOQd8g</a>	CO1	PPT	<a href="https://www.youtube.com/watch?v=VWmBzUOQd8g">https://www.youtube.com/watch?v=VWmBzUOQd8g</a>	Questions from Assignment	
15	L15	2	Interpolation Formulæ-Newton's Backward	Understand the Backward difference	Demonstration of loops	Flipped Classroom	Practical		CO1	Student PPT	<a href="https://www.youtube.com/watch?v=VWmBzUOQd8g">https://www.youtube.com/watch?v=VWmBzUOQd8g</a>	PPT by Student	
16	L16	2	Interpolation Formulæ-Newton's Backward	Understand the Backward difference	Demonstration of loops	Flipped Classroom	Practical	<a href="https://www.youtube.com/watch?v=VWmBzUOQd8g">https://www.youtube.com/watch?v=VWmBzUOQd8g</a>	CO1	PPT	<a href="https://www.youtube.com/watch?v=VWmBzUOQd8g">https://www.youtube.com/watch?v=VWmBzUOQd8g</a>		
17	L17	2	Divided difference formula	understand the difference formula and how it is differ from above two	Demonstration	Flipped Classroom	Practical	<a href="https://www.youtube.com/watch?v=VWmBzUOQd8g">https://www.youtube.com/watch?v=VWmBzUOQd8g</a>	CO2	PPT	<a href="https://www.youtube.com/watch?v=VWmBzUOQd8g">https://www.youtube.com/watch?v=VWmBzUOQd8g</a>	Questions from Assignment	
18	L18	2	Langrange's Formula	Understand the Langrange's formula and advantage of this formula	Demonstartion	Flipped Classroom	Practical	<a href="https://www.youtube.com/watch?v=VWmBzUOQd8g">https://www.youtube.com/watch?v=VWmBzUOQd8g</a>	CO2	PPT	<a href="https://www.youtube.com/watch?v=VWmBzUOQd8g">https://www.youtube.com/watch?v=VWmBzUOQd8g</a>	Questions from Assignment	
19	L19	2	Bisection method	Understand the concept of bisection method with example	Demonstartion	Flipped Classroom	Practical	<a href="https://www.youtube.com/watch?v=VWmBzUOQd8g">https://www.youtube.com/watch?v=VWmBzUOQd8g</a>	CO2	PPT	<a href="https://www.youtube.com/watch?v=VWmBzUOQd8g">https://www.youtube.com/watch?v=VWmBzUOQd8g</a>	Questions from Assignment	
20	L20	2	False position method	Understand the concept of false position method with example	Demonstartion	Flipped Classroom	Practical	<a href="https://www.youtube.com/watch?v=VWmBzUOQd8g">https://www.youtube.com/watch?v=VWmBzUOQd8g</a>	CO1,CO2	PPT	<a href="https://www.youtube.com/watch?v=VWmBzUOQd8g">https://www.youtube.com/watch?v=VWmBzUOQd8g</a>		
21	L21	2	Newton raphson method	Understand the concept of NR method	Demonstartion	Discussion	Practical	<a href="https://www.youtube.com/watch?v=VWmBzUOQd8g">https://www.youtube.com/watch?v=VWmBzUOQd8g</a>	CO1,CO2	PPT	<a href="https://www.youtube.com/watch?v=VWmBzUOQd8g">https://www.youtube.com/watch?v=VWmBzUOQd8g</a>	Viva-2	
22	L22	3	Gaussian Elimination Method	Understand the gauss elimination with example	Numerical	Lecture through PPT	Practical	<a href="https://www.youtube.com/watch?v=VWmBzUOQd8g">https://www.youtube.com/watch?v=VWmBzUOQd8g</a>	CO1,CO2	PPT	<a href="https://www.youtube.com/watch?v=VWmBzUOQd8g">https://www.youtube.com/watch?v=VWmBzUOQd8g</a>	Viva-2	

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23	L23	3	LU decomposition	Understand the concept of LU decom.	Numerical	Flipped Classroom	Practical	<a href="https://www.coursera.org/lecture/c-for-everyone/storage">https://www.coursera.org/lecture/c-for-everyone/storage</a>	CO2	PPT	<a href="http://youtu.be/PhelkDewiQ">http://youtu.be/PhelkDewiQ</a>	Viva-2	
24	L24	3	Gauss jacobi method	Understand the concept of gauss Jacobi with example	Numerical	Flipped Classroom	Practical	<a href="https://www.youtube.com/watch?v=ZITc1etqK0s">https://www.youtube.com/watch?v=ZITc1etqK0s</a>	CO2	PPT	<a href="https://youtu.be/9abekOea5iQ">https://youtu.be/9abekOea5iQ</a>	Viva-2	
25	L25	3	Gauss seidel method	Understand the concept of Gauss seidel with example		Flipped Classroom	Practical	<a href="https://www.youtube.com/watch?v=ZITc1etqK0s">https://www.youtube.com/watch?v=ZITc1etqK0s</a>	CO1,CO2	PPT	<a href="https://www.youtube.com/watch?v=X45pdR4lc3M">https://www.youtube.com/watch?v=X45pdR4lc3M</a>		
26	L26	3	Gauss jordan method	Understand the concept of Gauss jordan with example	Numerical	Lecture through PPT	Practical	<a href="https://www.youtube.com/watch?v=4sPWotthkgw">https://www.youtube.com/watch?v=4sPWotthkgw</a>	CO1,CO2	PPT	<a href="https://youtu.be/kM12yeyrANU">https://youtu.be/kM12yeyrANU</a>	Viva-3	
27	L27	3	Numerical Differentiation	Understand the concept of numerical differentiation on tabular form	Numerical	Lecture through PPT	Brainstorming	<a href="https://www.youtube.com/watch?v=4sPWotthkgw">https://www.youtube.com/watch?v=4sPWotthkgw</a>	CO1,CO2	PPT	<a href="https://youtu.be/kM12yeyrANU">https://youtu.be/kM12yeyrANU</a>	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	<a href="https://www.youtube.com/watch?v=xpD7YiXlaFdg">https://www.youtube.com/watch?v=xpD7YiXlaFdg</a>	CO1,CO2	PPT	<a href="https://youtu.be/kM12yeyrANU">https://youtu.be/kM12yeyrANU</a>	Viva-3	
29	L29	3	Second order differentiation	Understand the concept of second differentiation	Numerical	Flipped Classroom	Brainstorming	<a href="https://www.youtube.com/watch?v=udfbq4M2Kfc">https://www.youtube.com/watch?v=udfbq4M2Kfc</a>	CO1,CO2	Student PPT	<a href="https://www.youtube.com/watch?v=udfbq4M2Kfc">https://www.youtube.com/watch?v=udfbq4M2Kfc</a>	Student PPT	
30	L30	3	Numerical Integration	Understand the concept of numerical integration	Numerical	Flipped Classroom	Brainstorming	<a href="https://www.youtube.com/watch?v=_NEiVgiGp8Q">https://www.youtube.com/watch?v=_NEiVgiGp8Q</a>	CO1,CO2	Student PPT	<a href="https://youtu.be/US42ZBAOcBY">https://youtu.be/US42ZBAOcBY</a>	Student PPT	
31	L31	3	Trapezoidal Rule	Understand the trapezoidal rule with example	Numerical	Flipped Classroom	Brainstorming	<a href="https://www.youtube.com/watch?v=lj71sDmmKpc">https://www.youtube.com/watch?v=lj71sDmmKpc</a>	CO1,CO2	Student PPT	<a href="https://youtu.be/US42ZBAOcBY">https://youtu.be/US42ZBAOcBY</a>	Student PPT	
32	L32	3	Simpsons 1/3 rule	Understand the Simpson 1/3 rule with example	Numerical	Flipped Classroom	Brainstorming	<a href="https://www.youtube.com/watch?v=jj71sDmmKpc">https://www.youtube.com/watch?v=jj71sDmmKpc</a>		PPT	<a href="https://youtu.be/US42ZBAOcBY">https://youtu.be/US42ZBAOcBY</a>		
33	L33	4	Formulation of linear Programming model	Understand the Basic concept of linear programming	Numerical	Flipped Classroom	Brainstorming	<a href="https://www.youtube.com/watch?v=E-CRY8LTBsw">https://www.youtube.com/watch?v=E-CRY8LTBsw</a>	CO1,CO2	PPT	<a href="https://youtu.be/US42ZBAOcBY">https://youtu.be/US42ZBAOcBY</a>	Viva	
34	L34	4	Graphical method of solving linear	Understand the graphical method with example	Numerical	Flipped Classroom	Brainstorming	<a href="https://www.youtube.com/watch?v=Bn7QCzJxIY4">https://www.youtube.com/watch?v=Bn7QCzJxIY4</a>	CO1,CO3	PPT	<a href="https://youtu.be/Bn7QCzJxIY4">https://youtu.be/Bn7QCzJxIY4</a>	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	<a href="https://www.youtube.com/watch?v=suNlv7LQNO">https://www.youtube.com/watch?v=suNlv7LQNO</a>	CO1,CO3	PPT	<a href="https://youtu.be/Bn7QCzJxIY4">https://youtu.be/Bn7QCzJxIY4</a>	Viva	
36	L36	4	General structure of transportation	Understand the transportation problems	Numerical	Lecture through PPT	Brainstorming	<a href="https://www.youtube.com/watch?v=27BSbkj4">https://www.youtube.com/watch?v=27BSbkj4</a>	CO1,CO3	PPT	<a href="https://youtu.be/Bn7QCzJxIY4">https://youtu.be/Bn7QCzJxIY4</a>		
37	L37	4	solution procedure for transportation problem	Understand the procedure for TP	Numerical	Lecture through PPT	Brainstorming	<a href="https://www.youtube.com/watch?v=AE-27BSbkj4">https://www.youtube.com/watch?v=AE-27BSbkj4</a>	CO1,CO3	PPT	<a href="https://youtu.be/Bn7QCzJxIY4">https://youtu.be/Bn7QCzJxIY4</a>	Viva	
38	L38	4	methods for finding initial solution	Understand the method to find the initial solution	Numerical	Discussion	Brainstorming	<a href="https://www.youtube.com/watch?v=AE-27BSbkj4">https://www.youtube.com/watch?v=AE-27BSbkj4</a>	CO1,CO3	PPT	<a href="https://youtu.be/Bn7QCzJxIY4">https://youtu.be/Bn7QCzJxIY4</a>	Viva	
39	L39	4	test for optimality	Understand the method to find the test for optimality	Numerical	Lecture through PPT	Brainstorming	<a href="https://www.youtube.com/watch?v=AE-27BSbkj4">https://www.youtube.com/watch?v=AE-27BSbkj4</a>	CO1,CO3	PPT	<a href="https://youtu.be/Bn7QCzJxIY4">https://youtu.be/Bn7QCzJxIY4</a>	Viva	

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40	L40	4	Maximization of transportation problem	Understand how find the maximization of TP	Numerical	Lecture through PPT	Brainstorming	<a href="https://www.youtube.com/watch?v=mSgYw37J8c4">https://www.youtube.com/watch?v=mSgYw37J8c4</a>	CO1,CO3	PPT	<a href="https://youtu.be/Bn7QCzJxIY4">https://youtu.be/Bn7QCzJxIY4</a>		
41	L41	4	unbalanced transportation problem	Understand the concept of unbalanced Tranpostation problem	Numerical	Discussion	Brainstorming	<a href="https://www.youtube.com/watch?v=sjXto3EZoxM">https://www.youtube.com/watch?v=sjXto3EZoxM</a>	CO1,CO3	PPT	<a href="https://youtu.be/Bn7QCzJxIY4">https://youtu.be/Bn7QCzJxIY4</a>	Viva	
42	L42	4	Assignment problem approach of the assignment model	Understand asslgnment problem	Numerical	Discussion	Brainstorming	<a href="https://www.youtube.com/watch?v=S_fPMrrIA30">https://www.youtube.com/watch?v=S_fPMrrIA30</a>	CO1,CO3	PPT	<a href="https://youtu.be/Bn7QCzJxIY4">https://youtu.be/Bn7QCzJxIY4</a>	Viva	
43	L43	4	Solution methods of assignment problem,Maximization in an assignment	Understand the method of assignment problem	Numerical	Lecture through PPT	Brainstorming	<a href="https://www.youtube.com/watch?v=S_fPMrrIA30">https://www.youtube.com/watch?v=S_fPMrrIA30</a>	CO1,CO3	PPT	<a href="https://youtu.be/Bn7QCzJxIY4">https://youtu.be/Bn7QCzJxIY4</a>	Viva	
44	L44	4	Unbalanced assignment problem,Restriction on assignment	Understand the concept of maximization In an assignment	Numerical	Lecture through PPT	Brainstorming	<a href="https://www.youtube.com/watch?v=0Rlypy2CqQ">https://www.youtube.com/watch?v=0Rlypy2CqQ</a>	CO1,CO3	PPT	<a href="https://youtu.be/Bn7QCzJxIY4">https://youtu.be/Bn7QCzJxIY4</a>	Viva	
45	L45	4	SOLUTION OF LINEAR SIMULTANEOUS EQUATIONS	Understand the concept of SOLUTION OF LINEAR SIMULTANEOUS EQUATIONS	Numerical	Lecture through PPT	Brainstorming	<a href="https://www.youtube.com/watch?v=NUnrlrmVIUc">https://www.youtube.com/watch?v=NUnrlrmVIUc</a>	CO1,CO3	PPT	<a href="https://youtu.be/Bn7QCzJxIY4">https://youtu.be/Bn7QCzJxIY4</a>	Viva	
46	L46	4	SOLUTION OF LINEAR SIMULTANEOUS EQUATIONS	Revised & Understand the concept of SOLUTION OF LINEAR SIMULTANEOUS EQUATIONS	Numerical	Lecture through PPT	Brainstorming	<a href="https://www.youtube.com/watch?v=NUnrlrmVIUc">https://www.youtube.com/watch?v=NUnrlrmVIUc</a>	CO1,CO3	PPT	<a href="https://youtu.be/Bn7QCzJxIY4">https://youtu.be/Bn7QCzJxIY4</a>	Viva	
47	L47	4	Gaussian Elimination	Revised & Understand the concept of SOLUTION OF LINEAR SIMULTANEOUS EQUATIONS	Numerical	Discussion	Brainstorming	<a href="https://www.youtube.com/watch?v=nACnUIH7J6g">https://www.youtube.com/watch?v=nACnUIH7J6g</a>	CO1,CO3	PPT	<a href="https://youtu.be/Bn7QCzJxIY4">https://youtu.be/Bn7QCzJxIY4</a>	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 <a href="https://royalsocietypublishing.org/doi/full/10.1098/">https://royalsocietypublishing.org/doi/full/10.1098/</a>	CO1,CO3	PPT	<a href="https://youtu.be/Bn7QCzJxIY4">https://youtu.be/Bn7QCzJxIY4</a>		
49	L49	4	LU Decomposition	Understand the concept LU Decomposition.		Flipped Classroom	Brainstorming	<a href="https://www.youtube.com/watch?">https://www.youtube.com/watch?</a>	CO4	Student PPT	<a href="https://youtu.be/Bn7QCzJxIY4">https://youtu.be/Bn7QCzJxIY4</a>	Student PPT	
50	L50	4	NUMERICAL DIFFERENTIATION	Understand the NUMERICAL DIFFERENTIATION		Flipped Classroom	Brainstorming	<a href="https://www.youtube.com/watch?">https://www.youtube.com/watch?</a>	CO4	Student PPT	<a href="https://youtu.be/Bn7QCzJxIY4">https://youtu.be/Bn7QCzJxIY4</a>	Student PPT	
51	L51	4	First and Second Order	Understand theFirst and Second Order		Flipped Classroom	Brainstorming	<a href="https://www.youtube.com/watch?">https://www.youtube.com/watch?</a>	CO4	Student PPT	<a href="https://youtu.be/Bn7QCzJxIY4">https://youtu.be/Bn7QCzJxIY4</a>	Student PPT	
52	L52	4	Derivatives at Tabular	Understand the Derivatives at Tabular		Flipped Classroom	Brainstorming	<a href="https://www.youtube.com/watch?">https://www.youtube.com/watch?</a>	CO4	Student PPT	<a href="https://youtu.be/Bn7QCzJxIY4">https://youtu.be/Bn7QCzJxIY4</a>	Student PPT	
53	L53	4	Non-Tabular Points,	Understand the Non-Tabular Points		Flipped Classroom	Brainstorming	<a href="https://www.youtube.com/watch?">https://www.youtube.com/watch?</a>	CO4	Student PPT	<a href="https://youtu.be/Bn7QCzJxIY4">https://youtu.be/Bn7QCzJxIY4</a>	Student PPT	
54	L54	4	NUMERICAL INTEGRATION	Understand the NUMERICAL INTEGRATION		Flipped Classroom	Brainstorming	<a href="https://www.youtube.com/watch?v=NUnrlrmVIUc">https://www.youtube.com/watch?v=NUnrlrmVIUc</a>	CO4	Student PPT	<a href="https://youtu.be/Bn7QCzJxIY4">https://youtu.be/Bn7QCzJxIY4</a>	Student PPT	
55	L55	4	Trapezoidal Rule	Understand the Trapezoidal Rule		Flipped Classroom	Brainstorming	<a href="https://www.tutorialspoint.com/">https://www.tutorialspoint.com/</a>	CO1	Student PPT	<a href="https://youtu.be/Bn7QCzJxIY4">https://youtu.be/Bn7QCzJxIY4</a>	Student PPT	
56	L56	4	Simpsons 1/3 Rule	Understand the Simpsons 1/3 Rule		Flipped Classroom	Brainstorming	<a href="https://www.tutorialspoint.com/">https://www.tutorialspoint.com/</a>	CO1	Student PPT	<a href="https://youtu.be/Bn7QCzJxIY4">https://youtu.be/Bn7QCzJxIY4</a>	Student PPT	

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57	L57	4	Error in Each	Understand the Error in Each		Discussion	Brainstorming	<a href="https://en.wikipedia.org/wiki/Process_h">https://en.wikipedia.org/wiki/Process_h</a>	CO4	PPT	<a href="https://youtu.be/Bn7QCzJxIY4">https://youtu.be/Bn7QCzJxIY4</a>	Viva	
58	L58	4	Formula (without proof.)	Understand the Formula (without proof.)		Discussion	Brainstorming	<a href="https://en.wikipedia.org/wiki/Process_h">https://en.wikipedia.org/wiki/Process_h</a>	CO4	PPT	<a href="https://youtu.be/Bn7QCzJxIY4">https://youtu.be/Bn7QCzJxIY4</a>	Viva	
59	L59	4	Jordan Method	Understand the concept Jordan Method		Discussion & Doubt Clearing session	Brainstorming	<a href="https://en.wikipedia.org/wiki/Process_h">https://en.wikipedia.org/wiki/Process_h</a>	CO4	PPT	<a href="https://youtu.be/Bn7QCzJxIY4">https://youtu.be/Bn7QCzJxIY4</a>	Viva	
60	L60	4	Matrix Method.	Understand the Matrix Method.		Discussion & Doubt Clearing session	Brainstorming	<a href="https://en.wikipedia.org/wiki/Process_h">https://en.wikipedia.org/wiki/Process_h</a>	CO4	PPT	<a href="https://youtu.be/Bn7QCzJxIY4">https://youtu.be/Bn7QCzJxIY4</a>	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. Saurin "Numerical Analysis", Prentice Hall of India, 1998
TB2.	2. Johnson, R., Miller, L. and Freund, J., Miller and Freund's "Probability and Statistics for", Pearson 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 Foundation 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 Levin & Mathews Leon, "Introduction to Computers", VIKAS Publishing
RB3.	3 Gupta S C, Kapoor V K "Fundamentals of Mathematical Statistics" Sultan Chand and Sons 11th edition 2002
RB4.	4. Manmohan, Gupta, P K, Kanhi Swarup "Introduction to Management science operations research" Sultan Chand

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