

DEPARTMENT OF COMPUTER SCIENCE				CLASS: II B.Sc. Computer Science				
Sem	Course Type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
III	Allied-3	20U3DAT3	Numerical methods	5	6	25	75	100

Nature of Course			
Knowledge and skill	✓		Employability oriented
Skill oriented			Entrepreneurship oriented

### COURSE OBJECTIVES :

This course is designed

- \* To impart the knowledge of computer arithmetic operations and
- \* To learn various numerical computational method

Units	Numerical methods	Total Hours: 90	K-levels
Unit -I	Algebraic and Transcendental Equations: Errors in numerical computation Iteration method-Bisection method-Regula-Falsi method-Newton-Raphson method-Horner's method.	18 hrs	Up to K2
Unit-2	Simultaneous Equations: Introduction-Simultaneous equations-Back substitution-Gauss Elimination method-Gauss –Jordan Elimination method Calculation of Inverse of a matrix- Iterative methods-Gauss Jacobi Iteration method-Gauss seidal Iteration method	18 hrs	Up to K3
Unit-3	Interpolation & Introduction: Newton's interpolation Formulae Central difference Interpolation formulae-Gauss forward, Gauss backward, Lagrange's interpolation formulae- Divided differences Newton's divided difference formula-Inverse Interpolation.	18 hrs	Up to K3
Unit-4	Numerical Differentiation and Integration: Introduction-Derivates using Newton's forward difference formula-Derivates using Newton's backward difference formula- Numerical Integration- Simpson's 1/3 <sup>rd</sup> rule-Simpson's 3/8 <sup>th</sup> rule.	18 hrs	Up to K4
Unit-5	Numerical Solution of Ordinary Differential Equations: Introduction-Taylor series method-Picard's method-Euler's method Range-kutta method of second, third, fourth order.	18 hrs	Up to K4

### Books for Study:

1.Numerical Methods, Second Edition, S.Arumugam, A.Thangapandi Issac, A.Somasundaram, SCITECH publications, 2009.

Unit I : Chapter-3

Unit II : Chapter-4 (excluding Relation method and its related problems)

Unit III : Chapter-7 (Sections: 7.0, 7.1, 7.2(i), (ii) and related problems); 7.3,7.4,7.5,7.6) Unit IV : Chapter-8 (Sections: 8.0,8.1,8.2 related problems, 8.5 (excluding Weddles rule, Booles rule, Romberg's method and related problems))  
Unit V : Chapter-10 (Sections : 10.0,10.1,10.2,10.3(excluding modified Euler's method & its related problems) 10.4,10.5,10.6 )

### **Books for Reference :**

1. Mathews J.H. Numerical Method for Maths, Science and Engineering; PHI, New Delhi, 2001.
2. Iqbal H. Khan & Q. Hassan Numerical Methods for Engineers and Scientist - Galgotia Publications (P) Ltd., New Delhi - 1997.
3. M.K. Jain, S.R.K. Iyengar &R.K.Jain - Numerical Methods for Scientific andEngineering Computation - New Age International(P) Ltd., New Delhi - 1996

### **Web resources:**

1. <https://www.math.ust.hk/~machas/numerical-methods.pdf>
2. <http://www.mi.sanu.ac.rs/~gvm/Teze/Numerical%20methods%20In%20Computational%20Engineering.pdf>

### **Rationale for Nature of the course:**

This course Numerical methods is needed to solve mathematical problems that lead to equations that cannot be solved analytically with simple formulas. Examples are solutions of large systems of algebraic equations, evaluation of integrals, and **solution** of differential equations. Knowledge gained with this course may be very useful to learn datamining techniques with AI.

### **Activities having direct bearing on Skill development / Employability /Entrepreneurship**

- Seminar
- Assignment preparation
- Thinking and analysis on theoretical concepts

### **Pedagogy:**

The teaching methods includes Chalk and talk, PowerPoint, demonstrations, assignments and solving many assignment problems.

**Lecture schedule:**

<b>Unit</b>	<b>Topics</b>	<b>Hrs</b>	<b>Mode</b>
Unit I	Algebraic and Transcendental Equations: Errors in numerical computation Iteration method	6	Chalk and talk, Quiz and assignment
	Bisection method-Regula-Falsi method	6	
	Newton-Raphson method-Horner's method.	6	
Unit II	Simultaneous Equations: Introduction-Simultaneous equations-Back substitution-Gauss Elimination methodGauss	6	Chalk and talk, Group discussion
	Jordan Elimination method Calculation of Inverse of a matrix- Iterative methods	6	
	Gauss Jacobi Iteration method-Gauss seidal Iteration method	6	
Unit III	Interpolation & Introduction: Newton's interpolation Formulae-Central difference Interpolation formulae- -	6	Chalk and talk, Quiz and assignment
	Gauss forward, Gauss backward, Lagrange's interpolation formulae	5	
	Divided differences-Newton's divided difference formulaInverse Interpolation.	6	
Unit IV	Numerical Differentiation and Integration: Introduction- Derivates using Newton's forward difference formula- -	6	PPT, Chalk and talk, Quiz and assignment
	Derivates using Newton's backward difference formula- Numerical Integration-	6	
	Simpson's 1/3 <sup>rd</sup> rule-Simpson's 3/8 th rule.	6	
Unit V	Numerical Solution of Ordinary Differential Equations: Introduction	6	PPT, Chalk and talk, Quiz and assignment
	Taylor series method-Picard's method-Euler's method	6	
	Range-kutta method of second, third, fourth order.	6	

**Learning Outcome Based Education & Assessment (LOBE)**  
**Blue Print – Numerical methods**  
**Articulation Mapping – K Levels with Courses Learning Outcomes (CLOs)**

**BLUE PRINT FOR INTERNAL ASSESSMENT – I**

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K- Level		
1.	CLO 1	Up to K 2	2	K1 & K2	1	K1	2(K1&K1)	1(K2)
2.	CLO 2	Up to K 3	2	K1 & K2	1	K2	2(K2&K2)	1(K3)
No. of Questions to be asked			4		3		4	3
No. of Questions to be answered			4		3		2	2
Marks for each Question			1		2		5	10
Total Marks for each Section			4		6		10	30

**BLUE PRINT FOR INTERNAL ASSESSMENT – II**

S. No.	CLOs	K-Level	Section A		Section B		Section C (Either / or Choice)	Section D (Open Choice)
			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K- Level		
3.	CLO 3	Up to K 4	2	K1 & K2	1	K2	2 (K3&K3)	1(K4)
4.	CLO 4	Up to K 3	2	K1 & K2	1	K1	2 (K3&K3)	1(K3)
No. of Questions to be asked			4		3		4	3
No. of Questions to be answered			4		3		2	2
Marks for each Question			1		2		5	10
Total Marks for each Section			4		6		10	30

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			MCQs		Short Answers			
			No. of Questions	K-Level	No. of Questions	K- Level		
1	CLO 1	Up to K-2	2	K1 & K2	1	K1	2 (K1&K1)	1(K2)
2	CLO 2	Up to K-3	2	K1 & K2	1	K2	2 (K2&K2)	1(K3)
3	CLO 3	Up to K-4	2	K1 & K2	1	K2	2 (K3&K3)	1(K4)
4	CLO 4	Up to K-3	2	K1 & K2	1	K1	2 (K3&K3)	1(K3)
5	CLO 5	Up to K-4	2	K1 & K2	1	K2	2 (K4&K4)	1(K3)
No. of Questions to be asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each Question			1		2		5	10
Total Marks for each Section			10		10		25	30

**Distribution of Section-wise Marks with K Levels**

K Levels	Section A (No Choice)	Section B (No Choice)	Section C (Either/or)	Section D (Open Choice)	Total Marks	% of Marks without choice	Consolidated
K1	5	4	10	-	<b>19</b>	15.83	<b>42%</b>
K2	5	6	10	10	<b>31</b>	25.83	
K3	-	-	20	30	<b>50</b>	41.67	<b>42%</b>
K4	-	-	10	10	<b>20</b>	16.67	<b>16%</b>
Total Marks	10	10	50	50	<b>120</b>	100.00	<b>100%</b>

**Distribution of Unit-wise questions with K Levels**

Section A	Section B	Section C	Section D
2 Questions for each Unit (K1 & K2 Level)	1 Question from each Unit (K1 & K2 Level)	2 Questions from Unit-I (K1 Level)	1 Question from Unit-I (K2 Level)
		2 Questions from Unit-II (K3 Level)	1 Question from Unit-II (K3 Level)
		2 Questions from Unit-III (K3 Level)	1 Question from Unit-III (K4 Level)
		2 Questions from Unit-IV (K2 Level)	1 Question from Unit-IV (K3 Level)
		2 Questions from Unit-V (K4 Level)	1 Question from Unit-V (K3 Level)

K1 –Remembering and recalling facts with specific answers

K2 – Basic understanding of facts and stating main ideas with general answers

K3 – Application oriented – Solving Problems

K4 – Examining, analyzing, presentation and make interferences with evidences

**COURSE OUTCOMES:**

On the completion of the course the students will be able to

COs	COURSE OUTCOME	Knowledge Level (basis of Bloom's Taxonomy)
CO-1	Understand the ideas related with computer arithmetic using numerical method concepts.	Up to K2
CO-2	Understand the concepts of iterative method and algorithm	Up to K3
CO-3	Demonstrate the concepts of interpolation and regression	Up to K3
CO-4	Demonstrate the concepts of Simpson's rule and integration formulae	Up to K4
CO-5	Acquire the knowledge related with numerical differentiation and integration.	Up to K3

**MAPPING OF COs WITH PSOs:**

Course Outcomes	PSO 1 (Knowledge Base)	PSO 2 (Problem Analysis & Investigation)	PSO 3 (Communication Skills & Design)	PSO 4 (Individual and Team Work)	PSO 5 (Professionalism Ethics and equity)	PSO 6 (Life Long Learning)
CO-1	1	1	1	2	1	1
CO-2	2	3	2	1	1	1
CO-3	2	3	1	1	1	2
CO-4	3	2	2	1	2	1
CO-5	2	2	2	3	2	1

3- Advanced Application

2- Intermediate

1- Introductory

**Course Designer(s):**

1. Prof.P.Sridevi
2. Prof.J.Mayajothi