B.Sc. Degree Course in Mathematics

(Common to B.Sc Physics, Chemistry and Computer Science)

Choose any one of the following papers

I OR III SEMESTER   1. NUMERICAL METHODS I

2.ALLIED MATHEMATICS I

Title of the Course	NUMERICAL METHODS – I					
Paper Number	ELECTIVE E1					
Category	Core	Year	I OR II	Credits	3	Course Code
		Semester	I OR III			
Instructional Hours per week	Lecture		Tutorial	Lab Practice	Total	
	4		--	--	4	
Pre-requisite	12th Standard Mathematics					
Objectives of the Course	➢ To know the methods of solving simultaneous linear equations. ➢ To acquire knowledge about forward differences and Backward differences and their relationship. ➢ Knowledge about central difference operators and problems based on various central differences formulae. ➢ To study Newton's divided difference formula and problems based on Lagrange's interpolation formula.					
Course Outline	**Unit I:** Solutions of algebraic and transcendental equations: Bisection method- Regula-falsi method - Newton-Raphson method. **Chapter 1** :Section 1.1, 1.3, 1.4 Hours : 12 **Unit II:** Solutions of Simultaneous Linear Equations: Gauss-Elimination method, Gauss -Jordan method, Crout's method, Gauss-Seidel method. **Chapter 2** : Section 2.1 to 2.4 & 2.6 Hours : 12 **Unit III:** Finite Differences: E operators and relation between them - Differences of a polynomial - Factorial polynomials- inverse operator Δ^{-1} -Summation Series. **Chapter 3 :** Section 3.1 to 3.4 & 3.6, 3.7 Hours : 12 **Unit IV:** Interpolation with Equal Intervals : Newton's Forward and Backward Interpolation formulae - Central Differences Formulae: Gauss - Forward and Backward Formulae - Stirling's Formula. **Chapter 4** : Section 4.1to 4.3 (omit 4.1a, 4.4) & 4.7 Hours : 12 **Chapter 5** : Section 5.1to 5.4.					

	Unit V: Interpolation with Unequal Intervals: Divided Differences - Newton's Divided Differences Formula for Interpolation - Lagrange's Formula for Interpolation - Inverse Interpolation-Lagrange's method Reversion of Series method. **Chapter 6** :Section 6.1, 6.2, 6.5 & 6.7 Hours : 12
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, problem solving, analytical ability, professional competency, professional communication and transferable skill.
Recommended Text	P.Kandasamy, K.Thilagavathy (2003) Calculus of Finite differences & Numerical Analysis, S. Chand & Company Ltd., New Delhi-55.
Reference Books	1. B.D. Gupta.(2001) *Numerical Analysis.*Konark Pub. Ltd., Delhi 2. M.K. Venkataraman. (1992) *Numerical methods for Science and Engineering* National Publishing Company, Chennai. 3. S. Arumugam. (2003) *Numerical Methods*, New Gamma Publishing, Palayamkottai. 4. H.C. Saxena. (1991) *Finite differences and Numerical analysis* S.Chand & Co., Delhi
Website and e-Learning Source	https://ocw.mit.edu/courses/22-15-essential-numerical-methods-fall-2014/pages/syllabus/ https://ocw.mit.edu/courses/18-330-introduction-to-numerical-analysis-spring-2004/

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO1: After studied unit -1, the student will be able to solve Iteration method- Regula-falsi method- Newton-Raphson method.

CLO2: After studied unit -2, the student will be able to calculate interpolation values by applying Gauss-Elimination method, Gauss-Jordan method.

CLO3: After studied unit -3, the student will be able to calculate Differences of a polynomial-Factorial polynomials- inverse operator Δ^{-1} -Summation Series.

CLO4: After studied unit -4, the student will be able to estimate one or more missing terms of the given set of data.

CLO5: After studied unit -5, the student will be able to estimate the interpolation value for unequal intervals based on Lagrange's formula of inverse interpolation.

	Pos						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	3	1	3	2	1	-	3	2	1
CLO2	3	2	3	2	1	1	3	2	1
CLO3	3	2	3	2	1	1	3	2	1
CLO4	3	2	3	2	1	1	3	2	1
CLO5	3	3	3	2	1	1	3	2	1

Title of the Course	**ALLIED MATHEMATICS – I**					
Paper Number	ELECTIVE COURSE I					
Category	Core	**Year**	I OR II	**Credits**	3	**Course Code**	
		Semester	I OR III				
Instructional Hours per week		**Lecture**		**Tutorial**	**Lab Practice**	**Total**
		4		-	--	4
Pre-requisite	12th Standard Mathematics					
Objectives of the Course	• Necessary skills to analyze and make decision on Assignment and Transportation problems Simple Harmonic Motion • To solve real world problems on Sequencing and Network and its applications					
Course Outline	UNIT-I: **Summation of series**: Binomial series -Exponential series - Logarithmic series -Simple Problems. Chapter 2: Sections : 2.1.3, 2.2, 2.2.1, 2.3, 2.3.3. Hours: 12					
	UNIT-II: **Matrices:** Symmetric – Skew-Symmetric – Hermitian– Skew – Hermitian – Orthogonal and Unitary matrices – Cayley - Hamilton theorem (without proof) – Verification - Computation of inverse of matrix using Cayley - Hamilton theorem. Chapter 4: Sections: 4.1.1 –4.1.6, 4.5.2 and 4.5.3. Hours: 12					
	Numerical Methods: Newton's method to find a root approximately. **Finite Differences**: Interpolation: Operators ,Δ, ∇,E, E^{-1} difference tables. Interpolation formulae: Newton's forward and backward interpolation formulae for equal intervals, Lagrange's interpolation formula. Chapter 3: Sections 3.4.1. Chapter 5 : Sections : 5.1 and 5.2. Hours:12					
	UNIT – IV: **Trigonometry**: Expansions of $\sin^n \theta$, $\cos^n \theta$, in a series of powers of $\sin\theta$ and $\cos\theta$ - Expansions of $\sin(n\theta)$ and $\cos(n\theta)$ in a series sines and cosines of multiples of "θ" - Expansions of $\sin\theta$, $\cos\theta$ and $\tan\theta$ in a series of powers of "θ" – Hyperbolic and inverse hyperbolic functions . Chapter 6: Section 6.1 – 6.3 Hours:12					
	UNIT-V: **Differential Calculus:** Successive differentiation, n th derivatives, Leibnitz theorem (without proof) and applications, Jacobians, maxima and minima of functions of two variables- Simple problems Chapter 1, Section 1.1 to 1.3.1. Hours: 12					

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TNPSC / others to be solved (To be discussed during the Tutorial hour)		
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill		
Recommended Text	Allied Mathematics, Volume I and Volume II by P. Duraipandian and S.Udayabaskaran, S. Chand Publications Volume I: Unit I – IV, Volume II – Unit V		
Reference Books	1. Ancillary Mathematics by S. Narayanan and T.K. Manickavachagom Pillay, S. Viswanathan Pinters, 1986, Chennai 2. Allied Mathematics by A. Singaravelu 3. Allied Mathematics by P.R. Vittal		

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CLO 1: Understand the concepts of Summation of Series.
CLO 2: Understand the concepts of Cayley Hamilton Theorem and inverse matrices.
CLO 3: Understand the concepts of finite differences.
CLO 4: Understand the knowledge about expansions, hyperbolic and inverse hyperbolic functions.
CLO 5: Understand the concept of Leibnitz theorem and functions of two variables

	Pos						PSOs		
	1	2	3	4	5	6	1	2	3
CLO1	2	3	1	3	1	1	3	1	1
CLO2	3	2	1	3	1	1	3	1	1
CLO3	3	2	1	3	1	1	3	1	1
CLO4	3	3	1	3	1	1	3	1	1
CLO5	3	2	1	3	1	1	3	1	1